# A Qualitative Study into the Supplier Selection Decision-Making Process in the Malaysian SME Manufacturing Industry

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A thesis submitted in partial fulfilment of the requirements of the University of Westminster for the degree of Doctor of Philosophy.

July 2017

# Abstract

In manufacturing, supplier selection is viewed as the foundation of supply chain management, as the choice of the supplier will inherently affect all other aspects of business. This study explores the supplier selection decision-making process within Malaysian manufacturing firms. Previous studies in supplier selection have focused on company performance and quality management. Preceding research in this field, offers evidence that the application of information technology tools, business intelligence tools and artificial intelligence tools can be beneficial to the supplier selection decision-making process. In particular, the study explores the presence and usage of the information technology tools, business intelligence tools and artificial intelligence tools, to support the supplier selection decision making process in Malaysian SME manufacturing companies.

Data for this research has been collected from six cases located in Malaysia, and was lead through semi-structured interviews. The findings present online global marketplaces as a supplier sourcing method, unstructured evaluation methods and supplier selection process. Information technology supports the supplier selection process by the usage of mobile applications and online communication tools to increase the speed of information exchange. Business intelligence presents tools developed in Malaysia, in alignment with the needs of Malaysian SME manufacturers.

Artificial intelligence tools presented no usage or presence in these cases. Finally, this study uncovers the impact of Malaysian culture on the supplier selection process and their supporting tools.

Amongst the contributions are: an understanding of the supplier selection process in the Malaysian SME manufacturing, shedding light on the supplier evaluation process, supplier selection criteria and supplier sourcing methods. Adding a new dimension to the existing body of literature is the use of ICT and BI tools, which support the supplier selection process. The contributions are of benefit to practitioners, as the components of the study sheds light into a non-western context.

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# List of Acronyms

**IT** – Information technology tools

**BI** – Business Intelligence

**AI** – Artificial Intelligence

**SEA** – South East Asia

**SME** – Small Medium Enterprise

# Acknowledgements

I would like to thank and express my deepest gratitude to my parents, Sandra and Henry Rahaman. Thank you for walking this road with me. Without your unconditional love, support and encouraging presence, this achievement would not have been possible.

To my supervisor, Dr. David Barnes, I would like to express my sincerest gratitude for your advice, encouragement and guidance throughout the process.

A massive thanks to Ben Meehan, for guiding me along the data analysis process. Your support and encouragement was indeed a blessing.

To participants of this study, thank you for sharing your knowledge and time with me. It was an invaluable experience and greatly appreciated.

Also, I would like to acknowledge my friends both near and far for your kind words and support.

To my fellow colleagues, you have been my partners throughout this journey. Thanks for the listening ear and the good times.

# Declaration

I declare that the material contained in this thesis is my own work.

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# Chapter 1: Introduction

## 1.1 Background and Motivation

The area of supplier selection has received extensive focus over the decades. The supplier selection process is viewed as the process where firms identify and evaluate, and enter into contracts with suppliers (Hugos, 2001). This decision-making process is viewed as one of the most important processes in supply chain management, since firms strive to select the right supplier to bring positive benefits to the business. However, while most companies can look at their supply chain and determine what is needed, their decisions are often not made with long-term considerations (Harwood, 2009). Recent studies suggest that firms should be aware of the important criteria for supplier selection in order to make the right choices in terms of the most efficient and effective supply chain (Choi and Hartley, 1996).

For businesses operating in the current competitive global economy, it is important to have a varied approved supplier list, not only for long term existing suppliers, but for working towards discovering new suppliers (Leeman, 2010). Various factors give new suppliers importance. Firstly, there may be new suppliers who have more superior products and services to those of the existing supplier. For instance, the supplier may have discovered better production process that significantly reduce their cost of production relative to the predominant production technology and process. Furthermore, the buyer may need additional suppliers to reduce production risks, to drive competition or simply to meet other supply objectives such as supplier diversity.

Although there are significant advantages of enabling an effective and efficient supplier selection process, the supplier selection decision-making process is viewed

as a multi criteria problem. Vonderembse and Tracy (1999), note that the supplier selection decision-making process lacks structure and has many inconsistencies within the selection criteria. These matters have affected the efficiency and effectiveness of the supplier selection decision-making process.

The key argument behind this process appears as an unstructured and complex problem (De Boer, et al., 1999). Past research states that the steps by which buyers select their suppliers are unstandardized. Past research also outlines different methods by which the supplier selection decision-making process is approached by the design of different selection models and frameworks. However, these models and frameworks are not designed for a specific industry, and do not factor in the most pertinent supplier selection criteria for specific industries. As a result, the researcher is motivated to explore the supplier selection decision-making process within small to medium manufacturing companies in Malaysia, as there is a shortcoming in available research into this issue. The current literature does not represent a specific country and a specific industry, where an investigation is ensued to discover the supplier selection decision making process, in how firms source their new suppliers, how existing suppliers are evaluated, and the current issues and problems existing specifically to Malaysian manufacturing.

In screening suppliers, businesses have to obtain information for several aspects of potential suppliers before considering them as a qualified supplier (Shmueli et al., 2007). Supplier selection decision-making can be a challenging task and in most cases for businesses, decisions are made under the realm of uncertainty. Kauffman et al., (2010), suggests that a solution to a more informed decision-making process would be the implementation and usage of information technology tools. Kauffman et al.,

(2010) also argues that the lack of information technology tools along with the human decision-making process presents the problem of high levels of uncertainty. Current research in this area, has addressed this problem by developing frameworks, and presenting solutions to streamline and offer a structured approach to the problem. However, these solutions have been approached by researchers in their own field of expertise. Moreover, these solutions have been isolated to particular problems, for instance, addressing the pricing to quality issue, as this presents itself as an issue for suppliers. However, there are other issues that have not been addressed with regards to the supporting role that information technology tools can assist with in making more informed decisions (Harwood, 2009). As a result, the researcher is motivated to investigate the usage and presence of information technology tools used to support the supplier selection decision-making process, as there is a shortcoming in current literature in this research area. Current literature does not present the information technology tools used to support the supplier selection decision-making process in small to medium enterprises in Malaysian manufacturing firms.

Moreover, business intelligence tools (BI) are used by businesses to transform raw data to useful information. This process helps to identify, create, and implement business opportunities. Hence BI allows for the interpretation of large complex data. Moreover, a complete picture of the effect of certain business decisions can be drawn. Businesses usually suffer from an overload of information and the information is stored in an unstructured way. In some cases, some data stored is also irrelevant to the supplier selection decision-making. As a result of this, the researcher is motivated to investigate the usage and presence of business intelligence tools in small to medium enterprises in Malaysian manufacturing firms. Current literature does not present the

business intelligence tools used by Malaysian manufacturing firms used to support the supplier selection decision-making process. The areas that will be explored include, identifying the business intelligence tools that are used to support the supplier selection decision-making process and the current obstacles faced with those business intelligence tools being used.

Artificial intelligence tools try to simulate human skills such as decision making (Crum et al., 2011). Artificial intelligence tools have also offered solutions to the supplier selection decision making process, by employing various techniques and approaches. However, the data used by these techniques and approaches extracts the supplier selection criteria from existing literature reviews (Carter and Easton, 2011). However, the resulting solutions are proved to be incomplete due to unstructured supplier selection decision-making by managers. Luo et al., (2008) states that the majority of frameworks and approaches were designed using quantitative criteria rather than qualitative. In methods where qualitative approaches have been used, the method presented itself as user friendly, and provides an advanced supplier selection function, and most importantly, the method is highly compatible with managers (Yi et al., 2009). As a result, this motivates the researcher to explore and investigate the usage and presence of artificial intelligence tools in small to medium enterprises in Malaysian manufacturing businesses. The areas that will be explored include: defining the artificial intelligence tools used to support the supplier selection decision-making process and the current obstacles faced with using these tools. Essentially, this study is justified on the grounds that the problem is a real phenomenon and studies so far undertaken in this field have not investigated the way in which the supplier selection decision-making process is supported by information technology tools, business

intelligence tools and artificial intelligence tools within small to medium enterprises in Malaysian manufacturing companies. The following subsection will discuss this gap in the existing research, and indicate how the researcher has developed the focus of this current study.

## 1.2 Contribution of Research

The endeavour of this research is to investigate the supplier selection decision-making process in small to medium Malaysian manufacturing companies, also the presence and usage of information technology tools, business intelligence tools and artificial intelligence tools used to support the decision-making process.

The research provides an in-depth understanding of the decision-making process, how suppliers are sourced or located, what the most relevant main supplier selection criteria is and which tools and technologies support the decision-making process. Moreover, this investigation undertakes the perspective from Malaysian manufacturing firms, whereas, past research efforts have been undertaken in a Western context. This research identifies Malaysia as a key player and a developing country, who contributes to the global economy and focuses on the supplier selection decision-making process, providing a contribution to knowledge.

## 1.3 Contribution to Method

After a thorough investigation of the extant literature, it has been found that studies of supplier selection decision-making have mostly been conducted using a quantitative or mixed-methods approach. The approach of this study is a qualitative case-study approach. Although not a new method, this method provides new insight into the

research phenomenon. This research used only the qualitative approach and uses the interpretivist paradigm. Moreover, this research is conducted by interviewing the people who are responsible for the supplier selection decision-making process, where rich data is being collected. The main motivation for this study is to gain a deeper understanding of the subject under investigation, and in this case, it is the supplier selection decision-making process of Malaysian manufacturing. Another attribute to the contribution of method is the use of computer software; this increases the rigour of the findings.

## 1.4 Contribution to the Practitioners and the Manufacturing Industry

Another endeavour of this research is to shed light on the supplier selection decision-making process in a non-western environment. The extant literature is positioned in Western environments, and practitioners would benefit from understanding the phenomenon within a different setting. The findings will also showcase the current issues faced by Malaysian manufacturers, which can be of benefit to practitioners and manufactures alike; therefore, developing solutions for the afore mentioned issues. Another benefit to practitioners and manufacturing companies would be the awareness of current information technology tools, business intelligence tools and artificial intelligence tools that different companies use to support their supplier selection decision-making process, for instance, the different tools used to support the sourcing or location of a new supplier, and which business intelligence tools are used to support their supply chains. In addition, in some cases, this includes the different supplier evaluation processes that are used to evaluate suppliers on the approved supplier list. This point also reflects on one of the gaps of this research, which states

that the supplier selection decision-making process is unstructured. However, the data will show how SMEs manage this process. Moreover, the research will also show findings on an emerging theme, which highlights the impact of the Malaysian culture on some of the themes of this research, for instance, the selection of new suppliers and the information technology theme of this research. These issues will be further discussed in the cross-case analysis and discussion sections of this thesis.

## 1.5 Research Aim and Objectives

### 1.5.1 Research Aim

1. To investigate and explore how the supplier selection decision-making process is conducted in Malaysian SME manufacturing.
2. To explore how Information Technology, Business Intelligence and Artificial Intelligence tools can support and improve the supplier selection decision-making process in Malaysian SME manufacturing.

### 1.5.2 Research Objectives

In order to achieve the above aim, the following list of objectives were formatted:

1. To investigate and explore the current usage and presence of information technology tools that support the supplier selection decision-making process in the Malaysian SME manufacturing industry.
2. To explore and identify the current usage and presence of business intelligence tools that support the supplier selection decision-making process in the Malaysian SME manufacturing industry.

3. To explore and identify the current usage and presence of artificial intelligence tools, which support the supplier selection decision-making process in the Malaysian SME manufacturing industry.
4. To propose and develop a conceptual framework showing the relationships between the supplier selection decision-making process and the information technology, business intelligence, and artificial intelligence tools that support the process in the Malaysian SME manufacturing industry.

## 1.6 Structure of the Thesis

This research is presented in eight chapters, the details of which are outlined in brief below.

**Chapter 1 - Introduction**

This opening chapter presents the significance and relevance of the research, showing why the researcher has identified this topic as being worthy of research. It gives an overall idea of the study, initiating by explaining the scope of the research and presenting the research problem, research gaps and research aim and objectives. This chapter also presents the contributions to knowledge, method and industry.

**Chapter 2 - Literature Review**

The second chapter in this thesis examines the existing research within supplier selection decision-making, the use and presence of information technology, the use and presence of business intelligence tools, the use and presence of artificial

intelligence tools and technologies and an overview of manufacturing in SMEs in Malaysian manufacturing. It does so by considering all research published in academic journals. This chapter identifies all of the shortcomings of the various studies undertaken so far, and identifies the void in supplier selection.

**Chapter 2.8 - The Conceptual Model**

In this chapter, the existing theoretical background to the focus of the study is introduced and discussed, during which the key research gaps are identified. On the basis of a void in the existing theory in the literature by the researcher, an initial conceptual model is developed which is then used as the basis for what the researcher would like to see answered in the research questions.

**Chapter 3 - Methodology**

In this chapter, a detailed explanation is provided on how research for this study was conducted. It shows how the research aims and objectives are achieved. It presents in detail the philosophical stance of the researcher and its relationship to the strategy chosen for this research. Additionally, an in-depth explanation of the data analysis process is given.

**Chapter 4 - Case Analysis**

This chapter presents the main findings from the six cases in this research. The detailed explanation and outcomes of each case are highlighted and supported by quotes from the interviewees.

**Chapter 5 - Cross Case Analysis**

This chapter provides a comparison of the six cases, showing the similarities and differences of each case, guided by the themes of the research. A summary of the findings is provided and the revised conceptual model is also touched upon in this chapter.

**Chapter 6 – Discussion**

This chapter discusses the highlighted themes of this research in combination with the literature review.

**Chapter 7 – Conclusion**

The final chapter concludes the thesis, as it discusses the key research findings and demonstrates how the study has approached and answered all of the research questions identified in Chapter One. This chapter will also discuss the limitations of the study and suggests future research topics.

# Chapter 2: Literature Review

## 2.1 Introduction

The supplier selection decision-making process is viewed as one of the most essential and critical aspects of the supply chain. Recent research shows that many solutions, methods and frameworks have made contributions to this issue. Information technology tools, business intelligence tools and artificial intelligence tools are highlighted as the main support to the supplier selection decision-making process. The amount of research in the stream has increased since the 1990's. A literature review conducted in the course of the research project reveals that research in the area of supplier selection is still insufficient and studies do not represent a holistic overview of the process. This chapter presents the background, in which this research project is set. The following sections contain an overview of perspectives in the supplier selection decision-making process, information technology tools, business intelligence tools, artificial intelligence tools used to support the supplier selection decision making process, and an overview and justification for using the country the study is based in. Ultimately, this leads to the literature gap, research questions and a conceptual framework. In order to identify literature gaps for this project, a systematic literature review approach was followed.

### 2.1 An Overview of the Supplier Selection Decision-Making Process

Supplier selection research focuses on supplier selection criteria, which relates to implementing methods and frameworks, to select the most appropriate supplier for effectiveness and efficiency. The literature identifies twenty-three criteria considered

in the decision-making process (De Boer, 1998; De Boer 2001). Following studies have carried on considering these highlighted criteria. Studies have taken the multi criteria issue and devised methods, and frameworks to solve this issue by the development of artificial intelligence tools. Since one of the main areas of this study, is to investigate the supplier selection decision-making process in Malaysian manufacturing, this chapter presents and overview of the appropriate literature from supplier selection decision-making research. It must be noted that a comprehensive literature review conducted in the course of this research project revealed that although supplier selection research expanded since 1999, the amount of studies is inadequate, considering the holistic supplier selection decision-making problems and issues.

## 2.2 The Supplier Selection Decision-Making Process

The process of supplier selection is one of the most challenging and critical endeavours in the supply chain management (De Boer et al., 2001; Weber et al., 1991; Choi and Hartley, 1996; Gunasekaran and Ngai; 2005; Stadtler; 2015). The "*choice of supplier has a direct significant impact on the quality, cost, and lead time of new products and technologies needed to meet new market demands*" (Lou et al., 2009). In light of this, studies have highlighted the main supplier selection criteria considered by firms in this decision-making process (Dickson 1966). "Since then, a number of conceptual and empirical articles on supplier selection have appeared (Weber and Current, 1990; Ansari and Modarress, 1988; Benton and Krajeweski, 1987; Krause et al., 1997;).

The supply chain is viewed as the backbone of the manufacturing industry, and supplier selection research is commonly centred on the manufacturing industry. The

supply chain is a system that connects several departments from procurement of the raw materials to manufacturing, warehouse, and distribution of the products to consumers (Lee, 2004). The geographical outsourcing for a cheaper supply and new market penetration adds to the complexity of the supply chain systems. However, the complexity is aggravated further by over-reliance on the industry for frequent introduction of new products as well as for dealing with a multi-range product as a strategic plan meant to meet segmented demands of the market. Research indicates that the Malaysian Steel Industry experience such complexities in a more severe manner compared to other sectors (Matthews and Dong-Sung Cho, 2007). This is due to the introduction of new models with a shorter product lifecycle compounded by fast order delivery needing a high level of flexibility and agility of the suppliers, hence aggravating the supply chain complexity.

The highlighted facts reflect the notion that with the inherent complexity, supply chain selection in the manufacturing sector will always be challenging. Moreover, the catastrophic incidences and other external factors also have a great stake on the supply chain systems (Pettit, 2008). For instance, the recent incident in Fukushima (Japan), which was devastated by a massive earthquake, nuclear disaster and floods, severely affected the Malaysian industries as well as other industries over the rest of the world (Kassim, 2009). The Malaysian manufacturing companies, which have their suppliers from these regions, suffered production problems. This shows that the purchasing function for every organization is increasingly viewed as the most critical component in the supplier selection (Smakman, 2004).

### 2.2.1 The Supplier Selection Process

In the current highly competitive environment, an efficient supplier selection process is very critical to the success of any manufacturing company (Chan et al., 2008). Research indicates that, within the confines of supplier selection process, the most important function is performed by the purchasing department (Chan and Qi, 2003; Tan 2001; Bruck 2005). The process of supplier selection is a multi-criteria process, which includes both quantitative and qualitative criteria and factors (Kahraman et al., 2003; Dulmin and Mininno, 2003). Nevertheless, according to Sharma et al., (2011), a trade-off between the intangible and tangible factors are essential in the selection of best suppliers and must be thoroughly reviewed (Besar et al., 2013). There are a number of techniques and models that have been developed to deal with evaluating and selecting the best suppliers. Some of the supplier selection process relevant to this study includes structured process, unstructured process, and trial buy (De Boer et al., 2001). Most criteria for supplier selection are price, quality, product and service structured (Kahraman et al., 2003; Bhutta & Huq, 2002; Handfield et al., 1999; Chen, 2011). Most buyers consider the cost to be the fundamental concern. However, there are more independent and interactive criteria that are increasingly being used by the manufacturers in Malaysia (Tahriri et al., 2008; Pan et al., 2012). Just as previously mentioned, the methods chosen in supplier selection are extremely vital in the whole selection process since the methods have significance on the results of the selection. This is the reason it is important to understand why a firm chooses one method or a combination of methods over others (Wadhwa and Ravindran, 2007).

There are many supplier selection methods that have been developed and classified by different scholars (De Boer et al., 2001). In the usual scenario when a company

sets out to choose or develop a supplier selection method, the result is always a combination of different methods with different strengths and advantages (Liu and Hui, 2005). These strengths are meant to meet the relevant company's selection needs. For that reason, it is crucial to explore a range of different selection methods and processes in order to understand their different applications and implications. There are many supplier selection methods available in literature and other research materials. Some researchers prefer linear weighing models where suppliers are rated on a variety of criteria. They also appreciate where the ratings are combined into a single score as in the case of the categorical model (See table 2.1). The models define and influence the supplier selection processes and this is why in an evaluation of the supplier processes it is imperative to make reference to a variety of models applicable to the inherent processes.

| Category | Criteria |
|---|---|
| Cost ratio (Stevens, 1978) | One dimensional (Only cost) |
| Categorical model (Zenz, 1981) | Multi-dimensional |
| Linear weighting (Bailey and Farmer, (1990) | Multi-dimensional |
| Weighted product method (Yoon and Naadimuthi, 1983) | Multi-dimensional |
| Mathematical programming (Buffa and Jackson, 1983; Narasimhan and Stovoff, 1986; Pan, 1989; Turner, 1988; Chaudry et al., 1993; Sharma et al., 1989; Weber and Current, 1993; Bender et al., 1985; Gaballa, 1974) | Multi-dimensional |
| Multi Attribute Utility Theory (Min, 1993) | Multi-dimensional |

| | |
|---|---|
| Decision Tree (Sookup 1987; England and Leenders (1975) | Multi-dimensional |

*Table 2.1, is adopted from De Boer (1998), to highlight the different supplier selection methods, and to show the criteria considered in these methods.*

### 2.2.2 Structured Supplier Selection Processes

The supply chain strategy is one of the most important competitive strategies that manufacturing firms in Malaysia employ to succeed in a highly competitive market. These companies use supply chain to integrate the various suppliers in order to satisfy the prevailing demand. However, it is important to indicate that the traditional supplier evaluation and selection methods always focus on the requirements of single firms and enterprises but fail to consider the entire supply chain (Min and Zhou, 2002; Umble et al, 2003). This is where a structured supplier selection process is present; the process enhances efficiency in the supplier evaluation and selection process and is arguably one of the best processes (Subramaniam and Shaw, 2004). The structured methodology for supplier selection in the Malaysian manufacturing industry is based on the supply chain integration architecture (Habidin and Yusof, 2013). In this process, the indicators and criteria for supplier selection are chosen to establish the framework of supplier selection. Subsequently, the potential suppliers are adequately screened through Data Envelopment Analysis (DEA). Finally, a multi-attribute decision-making (MADA) and the Techniques for Order Preference by Similarity to Ideal Solution are adapted to rank the potential suppliers (Jahani et al., 2015). From the highlighted details, it is evident that the structured supplier selection processes are relatively more comprehensive, and this explains why the method is widely adopted in the Malaysian manufacturing industry.

### 2.2.3 Unstructured Supplier Selection Processes

The Malaysian manufacturing industry has witnessed a massive transformation in relation to supply chain processes. There has been a shift from the traditional supplier selection methods, which puts emphasis on a single model to the use of multiple models (Sarkis and Talluri, 2002). The multiple models are used in an unstructured decision-making context and provide a viable tool for making informed decisions (Archer & Ghasemzadeh, 1999; Hall and Davis, 2007). Research indicates that multiple perspective approaches to supplier selection enable the decision makers to understand fully and participate in the decision-making process through sharing of knowledge (Meade and Sarkis, 1998). The move guarantees high-quality decisions; ideal for the manufacturing companies. The emphasis on the unstructured supplier selection process is triggered by the need for a multiple perspective decision-making processes. The process emphasizes collaboration and knowledge sharing between experts who are familiar with supplier relations and also the decision makers who are mandated to make the final decision.

### 2.2.4 How Suppliers are Located or Sourced in the Malaysian Manufacturing Industry

Malaysian manufacturing SMEs will often seek to work with suppliers who can consistently meet the standards and specifications of relevant companies in the industry. Most of these companies, especially those that operate globally, such as steel manufacturing companies, are committed to standards of conduct, which are compatible with globally responsible sourcing (Terziovski, 2003). When selecting suppliers through structured or unstructured processes, most companies in Malaysia

incorporate responsible sourcing criteria at every single stage of the process (Thiruchelvam, 2012). These standards are maintained by analysing the location of suppliers and the associated risks to the inclusion of sound and responsible sourcing metrics in the commodity scorecard (Cooper & Ellram, 1993). The scorecards adopted by various players in the industry provide an upfront strategic evaluation of the sourcing landscape. Moreover, the supplier codes used in the supplier selection are integrated into the day-to-day supply chain management, hence making the process more credible and efficient (Hervani et al., 2005).

Research indicates that suppliers can be identified or located from a variety of platforms and settings including trade shows. Trade shows alone offer countless opportunities, not only to identify an upcoming trend but also to network with potential suppliers. This engagement can lead one to find the right product source (Ganesan et al., 2009). Manufacturing companies in the country exploit both the local and international trade fairs, which attract thousands of exhibitors. Trade magazines are another way of locating a potential supplier, which is the most inexpensive method. From magazines, the supply chain stakeholders might identify an organization or industry dealing in the product that they are interested in, and are therefore a potential source of valuable supplier contacts (Van der Vorst & Beulens, 2002). Moreover, most of the country's manufacturing SMEs have access to their counterparts in other countries. These companies utilize this opportunity to locate sellers of their supplies (Chetty & Campbell-Hunt, 2003). However, supplier location can be compared to supplier identification. The process of identifying a potential supplier related to supplier location, involves the use of a shortlist and a combination of sources to give a broader base for supplier sourcing (Choy et al., 2002). Finally, as in other parts of the world,

supplier location and sourcing in Malaysia involves the use of directories, trade associations, exhibitions, and trade press.

### 2.2.5 Supplier Selection Criteria in Manufacturing: The Most Relevant Criteria Identified

According to Patil (2014), the supplier and buyer relationship in the manufacturing enterprise has received considerable attention in the recent past. The purchasing function is viewed as an essential strategic issue in the supply chain system (Patil, 2014; Lambert & Cooper, 2000). The findings assert that the material purchased can amount to more than 80% of the total product cost and it is evident that manufacturing organizations must endeavour to reduce the purchasing cost to the minimum. For this reason, such organizations must select the best supplier selection criteria. A supplier selection criteria is one of the key aspects of purchasing function (Spekman, 1988). This is the reason why the supplier selection criteria have been the focus of many researchers. Dickson (1996), identified 23 criteria that have to be considered by the purchasing personnel. However, out of the criteria considered by Dickson, there are three most critical. The most important of these are: delivery, quality and performance history (Patil, 2014, Weber et al., 1991; Atkinson, 1999; Kannan and Tan, 2002). However, some, such as Crosby et al., (1990) argues that price, delivery, and quality are the main criteria for supplier evaluation in the industrial market.

On the other hand, O' Shaughnessy & Lehman (1982) proposed five criteria that are: plenitude, economy, social norms, performance and agreements (Munck and Souza, 2012). Caddick & Dale (1998) proposed that production plan, control system, system validity, quality, item category, and price are the most important criteria. Weber et al., (1991) based on 74 articles and a comprehensive review of vendor evaluation

methods, deduced that quality was the most important criteria followed by delivery and cost (Patil, 2014). Patton (1996), and on the other hand proposed quality, delivery and price, equipment, technology, sales report, order process and the supplier financial position as some of the most important criteria. Barbarosoglu & Yazgac (1997, determined three different primary criteria, the performance of the supplier, the financial situation of the supplier, quality system of the supplier and technical capabilities. On the other hand, Ghodsypour and O'Brien (1998), states that cost, service and quality have a considerable effect on the supplier selection parameters.

Ellram (1996) added compatibility of management and orientation strategy to the traditional criteria. However, Razzaque and Sheng (1998) viewed the supplier selection criteria from the benefit perspective. These benefits included relationship closeness, profitability, and conformance quality and conflict resolution. Lin et al., (2011) argued that communication, reputation, relationship closeness, industry position, customer responsiveness and conflict-solving capabilities and are ideal for vendor selection (Patil, 2014). Finally, while much supplier selection criteria research has been done over the years, Weber et al (1991) criteria are considered to be the most common and are valued as the most important comprehensive studies ever conducted (Patil, 2014). Their proposition on supplier criteria included price, total service quality and delivery time.

Supplier selection decisions are the key decisions for many manufacturing firms. However, lack of innovation, high cost and poor product quality are the consequences of poor supplier selection (Hah et al., 1990). Research on supplier selection criteria in most cases utilizes case studies and experiments but does not make use of the operational decisions that are linked to the firm level data (Ellram, 1996). It is therefore

evident that there is a gap of a lack of qualitative research vs. quantitative. There is therefore a need to close the gap between theoretical supplier selection criteria and supplier selection in practice (Barratt et al., 2011; Lambert et al., 1998; Sarkis and Talluri, 2002; Sachan and Datta, 2013). Looking at the research conducted in the western world in comparison to that conducted in Southern East Asia, the qualitative and quantitative gap is higher in the case of South East Asia compared to the West. Nevertheless, despite these gaps, there is a general agreement that (Weber et al., 1991) these criteria are arguably the best since they are widely used for supplier selection (Nayakappa Patil, 2014). The identified reviews postulate that quality is of prime importance followed by delivery, price, and reputation of the relevant organization. Technical capacity followed by after sales services, financial position, and management follow in this sequence. However, the most recent criteria include payment terms, technology, manufacturing challenge, lead-time, personnel quality, driving force, solution orientation, environmental risks and global factors (Patil, 2014). These criteria are ideal in supplier selection and apply to all manufacturing companies not only in Malaysia but also in other parts of the world. Firms that aim to gain the competitive edge in the manufacturing arena must conduct ideal supplier selection through the use of appropriate supplier selection criteria. This is because the type and nature of a supplier determine the quality and price of their supplies. The same is reflected in the firm's output in terms of quality and price.

### 2.2.6 Supplier Evaluation or Auditing Process

In the current competitive environment, improper evaluation and selection of the right suppliers can impede an organization’s supply performance (Tan et al., 1998). The same assertion is echoed by the fact that supplier assessment and selection has

become a significant area of consideration for the purchasing stakeholders in Malaysian manufacturing, SMEs (Zailani et al., 2012). It has become increasingly necessary and important for organizations to get the best value for their money from suppliers. Malaysian manufacturing industries spend a huge percentage of their input in raw materials and component parts. In most companies, the cost of raw materials constitutes the main cost of the product, such that in some cases it constitutes more than 70% of the product output. For this reason, suppliers play a significant role in achieving the objectives of supply management. Thus, it is evident that the role of supply selection cannot be underestimated or overlooked as the ability of the purchasing department to contract the best suppliers for the organization could lead to a significant reduction in cost.

The manufacturing industry can, therefore, use the supplier selection to gain a competitive edge in the manufacturing sector globally. The same can enable the industry to join the manufacturing powerhouses such as China and the United States. The act of selecting a suitable supplier is always a difficult task. Different suppliers have varied weaknesses and strengths. These strengths and weaknesses require careful and intensive assessment (evaluation) before they can be ranked into different levels. These standards include certified, preferred and confirmed suppliers. However, the vendor selection process would be simpler if only one criterion was used in the decision-making process. Nonetheless, this is not always the case, as different manufacturers prefer to use a combination of different selection criteria (Giffin et al, 2006).

However, where several criteria are used, then it is appropriate to determine how far each criteria influences the decision-making process (Goffin et al., 2006). The

determination process can be done with respect to whether all are to be equally weighted or whether the impact varies according to the nature and type of criteria (Min, 1994). Nevertheless, the model development for the manufacturing industry in Malaysia must be done in a manner that ensures benefits to the purchaser (Anthony et al., 2012). Based on the information obtained through the evaluation process, supplier scorecards are either approved or not approved. The result of the decision made is whether or not to procure materials or services from a given supplier. For that reason, in many organizations, there is always an approved list (ASL) to which the qualified supplier is added. On the other hand, if the supplier is rejected then the supplier is not made available to the assessing company's team of procurement. Once evaluated, a supplier can be re-evaluated on a periodic basis. The continuous evaluation process is often annually referred to as supplier performance management (Tahriri et al., 2008).

The supplier evaluation process, whether structured or unstructured, is a continual process within the purchasing departments. The process forms a huge part of the pre-qualification step within the purchasing process as initially mentioned. In many organizations, the supplier evaluation process includes the input and participation of other departments as well. Most manufacturing firms, which are widely experienced in collecting vendor evaluation information, prefer to conduct the process in five distinct phases (Hewitt, 1994). The process always takes the form of interview or questionnaire and sometimes a site visit can be employed. The site visit involves an appraisal of various aspects of the supplier's business. These aspects include financial position, capacity, assurance, processes, organizational structure, and performance, and can either be structured or unstructured (Araz & Ozkarahan, 2007).

### 2.2.7 Protocols and Procedures

ISO 9001 Certification

The supplier selection criteria and strategies have protocols and procedures in place that stakeholders should adhere to in an effort to maximize vendor input. In the manufacturing industry, there is a cross-functional team of representatives from different departments of an organization who will have designed these protocols or procedures. The developed procedures, however, must be in line with the organization's goals and objectives. These team members will have technical competence and knowledge of the relevant products to be purchased. The same teams must also include members of the relevant departments that use the purchased items, however, the relative level of sophistication of quality systems include meeting regulatory requirements. The same can entail meeting the mandated quality system registration, for example, the ISO 9001.

The ISO 9001 is a quality management system. It is the most recognizable certification in the world and has been adopted by many industries, the manufacturing industry included (Briscoe et al., 2005; Brown et al., 1998). Organizations that implement an efficient Quality Management System benefit from stakeholders. The suppliers who are ISO certified are believed to have conformed to the quality standards required at the competitive industrial level, which ensures that companies who partner with such suppliers are guaranteed some level of quality (Brown et al., 2005). The ISO certification is an important inclusion in supplier selection procedures and protocols as

it is a demonstration of quality and efficiency (Boiral, 2012). The certification can also guarantee suppliers a broadened market scope for tenders and contracts as well as a competitive advantage in the market. Suppliers' conformity to ISO certification requirements can serve as a benchmark for evaluation and selection. Most manufacturing firms in Malaysia would prefer contracting with suppliers who are ISO certified as opposed to those that are not ISO certified (Guler et al., 2002).

ISO certification plays an important role in the supplier selection decision-making process. First the accreditation ensures that the manufacturers adopt Quality Management Systems. This can improve the business as well as help formulate standards that companies can follow. The ISO certification is therefore invaluable for both large and small organizations in the manufacturing industry. The improved service and quality through ISO certification can translate to customer loyalty which is ideal for gaining a competitive advantage. For this reason, the adoption of ISO certification is more than necessary for firms that wish to gain a competitive edge in the manufacturing industry (Mo and Chan, 1997).

### 2.2.8 Issues and Problems in the Supplier Selection Decision-Making Process.

Inaccurate Data and Training of Staff

Finally, there are drawbacks and benefits that come with a supplier evaluation or auditing process and which influence the success of the process (Thiruchelvam and Tookey, 2011). Some of these advantages include mitigation against performance failure or poor supplier performance. The same could entail ensuring that a company source from vendors who provide only high-standard products and high service levels. The supplier evaluation process can help suppliers and customers identify and remove some of the most hidden cost drivers within the supply chain. The performance

appraisal process can also motivate suppliers to improve their performance. However, some of the associated challenges associated with both structured and unstructured supplier evaluations include cost and resource commitments in establishing and maintaining an efficient and a robust system. Also, there are other challenges associated with gathering and specifying relevant and meaningful information (Thiruchelvam and Tookey, 2011). Scorecards that do not get to the root cause of the supplier's problems and data integrity are also challenges associated with supplier evaluation. Finally, making sure that evaluation of the current suppliers goes beyond measurement of the actual performance improvement is another challenge. For this reason, the commitment of management to support a supplier evaluation process is ideal and essential for the manufacturing industry. Apart from data integrity, training of staff on the new supplier evaluation criteria and pitfalls is costly and might come with hidden costs to the manufacturing firm (Shebab et al., 2004).

### 2.2.9 Knowledge Gaps in the Supplier Selection Decision-Making Process

The academic literature on supplier selection and supply chain management in general, has been growing in line with the developing customer focus on sustainable supply chains and practitioners. Whilst the existing literature delves upon methods of handling a combination of multiple suppliers and multi-criteria, there is no available decision on a support framework that can adequately address all of the inherent problems together. Furthermore, there is a need to integrate the available decision support methods into a robust system that can help practitioners faced with multi-stakeholders and multi-criteria decisions under uncertainty. The same applies to the supplier selection decision-making making process.

Current literature on supplier selection decision-making, positions itself in the Western world. With research evolving in America, Australia, Europe and the United Kingdom, there is a lack of understanding of the supplier selection process in Malaysia, or similar countries (Cooper and Lambert, 1998; Zailani et al., 2012; Tahriri et al., 2008). Relevant research commonly approaches the supplier selection decision-making problem in a quantitative or mixed methods approach, and using secondary data, there is a lack of research conducted in a qualitative manner, to gain insights on the supplier selection process, the supplier selection criteria, the protocols and procedures used, the supplier sourcing methods and current issues and problems within the supplier selection decision making process.

## 2.3 Information Technology Used to Support Supplier Selection Decision-Making Process.

### 2.3.1 Overview of the Role of Technology in Supplier Selection Decision-Making Process

The ability of the manufacturing firms to source from the right suppliers ensures prosperity and business growth (Subramani, 2004). The manufacturing industry is clouded by economic uncertainty just like other industries, and therefore suppliers must be evaluated with due diligence. The role of technology is "positively correlated with productivity growth" (Brynjolfsson et al., 1995). It is common knowledge that using the right strategy for supplier selection and management ensures that good suppliers are selected. This will adequately support manufacturers by making sure that they are flexible enough to meet the dynamic demands of their customers. Technology plays a critical role in ensuring that manufacturers in Malaysia are flexible enough to meet

their business goals and objectives (Ndubisi et al., 2005). Technology offers a high level of versatility and flexibility when it comes to supplier selection (Winkler, 2009). Nevertheless, quality remains a central focus of many manufacturing firms in the industry. For example, manufacturing enterprises in the semiconductor industry in Malaysia employ technology in their supplier selection in order to realise much-needed quality (Ndubisi, 2014). Technology and inventory management roadmaps are crucial supplier-management strategies with a strong influence on the three forms of manufacturing flexibility.

Supplier networks are often characterized by a huge number of vendor firms that work with a dominant network leader. The relationship between network leaders and suppliers is hugely asymmetric. The asymmetric nature of these systems plays a significant role in orchestrating the suppliers. They always campaign for the introduction of the SCMS in their supplier networks. However, all of these moves are facilitated by information technology. The benefits that emanate from the use of information technology are unevenly distributed and in most cases are skewed in favour of the network leaders. For this reason, most suppliers wish to design and manage a personal network. This is because even though participation of network leaders is necessary, the suppliers are less likely to benefit fully from such networks. These are some of the key underlying issues in the use of information technology in supplier selection and decision-making.

### 2.3.2 The Overall Perception of the Use of Information Technology Tools to Support Supplier Selection

Strategic Sourcing and Supplier Selection Technology

The implementation and use of technology is an integral part of supplier improvement and for upgrading goals and objectives (Subramani, 2005). The underlying notion that a good production system is that which suppliers are positioned to accommodate the variations and uncertainties in the buyers' business operations is dependent on technological advancement in its entirety (Sonmez, 2006). Currently, manufacturing firms in Malaysia are moving towards lean operations, and therefore minimisation of waste and avoidance of hidden cost are the key objectives of their operations management teams (Rasiah, 1996).

For this reason, such firms embrace the just-in-time (JIT) philosophy. These organizations prefer their suppliers to deliver products frequently, in small lots and at relatively lower prices. However, the facilitation of the just-in-time principle is dependent on technology, especially communication technology (Brynjolfsson and Hitt (2000). This new technology facilitates the efficient flow of information and materials in the supply chain (Sonmez, 2006). Moreover, suppliers may need to demonstrate particular innovative capabilities so as to gain a competitive advantage in the market. Vendor product innovation and technological advancements are measured in terms of Research and Development (R&D) and the acquisition of new technology. Most manufacturing companies in Malaysia are willing to improve their outputs when suppliers are willing to mobilize their product development and innovation capabilities.

There is enough evidence to prove that information and communication technology (ICT) improves the effectiveness of the supplier-buyer relationship (Paulraj and Chen, 2007; Gunasekaran and Ngai, 2004; Thakkar et al., 2008). Electronic matching between the two parties increases the level of transparency of the demand and supply

information within the supply chain system. The same can lead to a reduction in the supply chain lead time. The buyer-supplier relationship can be improved through the implementation of current technological facilities that improve the flow of information and materials across the supply chain system (Prajogo and Olhager, 2012). Moreover, the overall image of a product depends on the quality of service received, and this can be improved and enhanced through implementation of new and efficient technological facilities (Ndubisi et al., 2004). As previously mentioned, information technology has changed the manner in which manufacturing companies view and understand the needs of individual customers. This information technology, however, consists of four essential elements (Thiruchelvam and Tookey, 2011). These include tools, structure, mechanism and human features. The information technology is created through the use of value chain so as to join up these elements and continue the improvement and development of manufacturing organizations.

The dynamics of technology has significantly impacted on supplier selection methods. Traditionally, supplier selection models were based on cardinal data with minimal emphasis on ordinal data. Nevertheless, according to Saen (2007), the widespread use of manufacturing philosophies such as Just-In-Time (JIT), has shifted the focus to simultaneous use of both ordinal and cardinal in the supplier selection process. For example, in selecting the best suppliers using both ordinal and cardinal there is a need to use an innovative method, which is based on the Imprecise Data Envelopment Analysis (IDEA). One of the most conspicuous and inherent applications of information technology to supplier selection is E-procurement (Soliman et al., 2005; Gunasekaran and Ngai, 2004). The development of electronic data interchange and information

technology over the last two decades has revolutionized supply chain systems in the manufacturing industry (Davenport and Short, 1990).

### 2.3.3 Current Tools Used in Technological Supplier Selection

Current literature has identified the information technology tools used to support the supplier selection decision-making process as E-procurement tools. Procurement is one of the key aspects of supply chain management, and the advent of the Internet has introduced E-supplier selection. (Cheraghi et al., 2011). E-supplier selection has changed the way in which procurement is done to improve operation efficiency and reduce transaction and production costs (Davilla et al., 2003). However, a number of Small and Medium Enterprises (SMEs) still perceive E-supplier selection as infeasible, although the concept was introduced more than two decades ago (Wymer and Regan, 2013). The implementation of E-supplier selection in the manufacturing industry has increased productivity and efficiency (Presutti, 2003). However, it is interesting to indicate that a majority of the Small and Medium Enterprise (SMEs) are still sceptical about the benefits of E-supplier selection due to limited financial and human resources (Darko, 2012). Aside from this, countries such as Malaysia lack comprehensive technology development standards, required for implementing the system. Moreover, Malaysian communities lack the initiative of changing their practices to embrace E-procurement and E-supplier selection.

### 2.3.4 Problems Existing With the Tools Being Used

Although there are vast advantages of the application of information technology to vendor evaluation and selection, some inherent challenges come with the process. E-

procurement is the primary means of execution of E-supplier selection and evaluation in manufacturing firms (Jeong et al., 2012). However, there are myriads of challenges that comes with the application of technology in the procurement process (Ndubisi et al., 2004). According to Mastor (2010), the E-procurement process and framework faces resistance from human resistance to change and conflict standards and policies. These impediments pose a lot of pressure on the relevant companies and stakeholders, and hinders then from embracing E-supplier selection within the framework of supply chain management systems. Moreover, factors such as incompetent infrastructure can have a devastating impact on the technological tools used in the E-procurement process. This is the reason the E-procurement service provider argue that Malaysians are not ready for a Multimedia Super Corridor, which is an advanced local cyberspace project, because of the lack of technical expert competency, especially those required in the highly technical skills in the sector of Computer Networking System and the ATM technology (Olorunniwo and Jolayemi, 2014).

The legal constraint is another problem that faces the implementation of E-supplier evaluation and selection process. The legal issue of E-supply chain in the construction and manufacturing industry can be identified as lack of alignment jurisdiction, insecurity in E-transaction, legal liability, and confidentiality (Lambert et al., 1998). For instance, in the online supplier selection criteria, a lot of information may be made available to the general public hence compromising privacy and security of both supplier and the buyer. The constant exchange of confidential information can raise security concern since unscrupulous persons and business individuals. Finally, it is important to indicate that the use of E-supply chain in Malaysia has created enormous

opportunities both for suppliers and buyers (Patil, 2014). The tools used for supplier selection such as the internet google are not only technological, but are also socio-economic in nature (Madon, 2000; Jharkharia and Shankar, 2005). For manufacturing companies to implement a technological supplier selection processes and systems, there must be tradeoffs involved. Research indicates that with the current shorter product life cycle and the changing demands, companies are forced to embark online lean supply chain. However, the usual challenge is not just to realize a lean concept; the challenge is to work a lean solution based on the available technological facilities.

### 2.3.5 Knowledge Gap in Information Technology used to Support the Supplier Selection Decision-Making Process.

The application of information technology in supplier selection has been the norm in some manufacturing firms. However, there is an inherent gap in knowledge which limits full exploitation of the potential use of IT in supplier selection. First, while most manufacturers understand the value of information technology in vendor selection, there is a significant gap in how to capitalize and plan for these technologies. Secondly, there is a gap in skills and training. Many SMEs in Malaysia have not closed this gap, most of the knowledge is trapped in “silos”. For that reason, there is an increasing need for training and certification to merge operation technology (OT) in supplier selection and Information Technology (IT). Moreover, this will help manufacturers to handle the problem of an aging workforce and to attract the next wave of knowledgeable workers.

## 2.4 Business Intelligence Present in Malaysian Manufacturing

### 2.4.1 An Overview of Business Intelligence and its Application

Business intelligence (BI) refers to a managerial philosophy and a tool used to help organisations manage and refine business information with the objective of making more effective business decisions (Ghosal and Kim 1986; Gilad and Gilad 1986; Lonngvist and Pirtomaki, 2006). The information auctioned is meant to help the corporate executives, managers and other relevant stakeholders to make informed decisions. The BI encompasses various applications, tools, and methodologies that enable organizations to collect data from external sources and internal systems (Ranjan, 2009). The collected data are then prepared for analysis; queries are run against the data and then reports are created. Business intelligence is, therefore, an integral part of a decision-making tool within an organization. According to Ong et al., (2011), Business Intelligence (BI) has become an important aspect of organizations decision-making tools. The adoption of BI has helped many manufacturing firms to gain a competitive advantage in the manufacturing industry (Ong et al., 2011).

Developed countries such as France, Australia, and U.S.A have always embraced the use of BI in the decision-making process. According to Ong et al., (2011), the adoption of BI in developing countries such as Malaysia is seldom reported. Nonetheless, there are a few adoption cases of BI by Malaysian manufacturing companies. These companies employ the use of different BI capabilities based on their production capacity and operational scope. However, there is optimism that more Malaysian manufacturing SMEs, regardless of capacity or size, will embrace the use of BI and adopt the tool as a catalyst to support their business growth. Research indicates that in recent years, there has been an overwhelming enthusiasm toward business

intelligence (BI) tools (Yeoh, 2011). This assertion can be verified by the swelling numbers of parades of BI vendors as well as the increasing number of organizations adopting BI tools. This overwhelming enthusiasm can be attributed to organizations' recognition of the value of BI. Furthermore, despite an increase in the adoption of BI, reports of deployment of the tools in developing countries has been scarce, Malaysia included. The lack of press coverage is widely evident in Malaysia and this is doing the manufacturing industry a great disservice. For instance, many of the SMEs are unaware of BI tools, and they are likely to be doubtful of the associated value of Bid deployment. Also, those who are aware of the tools may still be sceptical of the return on investment that can bring a competitive edge to a business (Yusof et al., 2006).

### 2.4.2 Overall Usage and Presence of Business Intelligence Tools to Support Supplier Selection Decision-Making

Different BI tools have emerged recently. The emergence of various business tools has been triggered by the need to solve different and non-uniform problems. BI tools are generally used to enable organizations to understand their external and internal environment through a systematic collation, acquisition, exploitation of information and interpretation (Shollo and Kautz, 2010). However, there are many BI vendors in the market. Some of them include: Cognos, SAP, IBM, Oracle, SAS Information Builders, Micro Strategy and Microsoft (Boonsiritomachai et al., 2016). These vendors provide BI products as stand-alone BI tools or as integrated suites of BI applications. However, the scale of BI tools installed or implemented in a given organization depends on user requirements and business problems. For this reason, organizations can adopt different types of BI depending on their business problems and technological

capabilities (Medjahed et al., 2003). Moreover, there is no one BI tool that is best suited for all problems or one size to fit all (Hershel and Jones, 2005). The overall usage of BI and its relevance to the supplier selection decision making process depends on the organisation's goals and objectives. No single tool is well suited for organisations across the manufacturing SME industry (Lonngvist and Pirttimaki (2006)). BI tools can however, prove vital in supply chain management, for example, in the supplier selection decision making process and supplier evaluation. For supplier selection decision making, BI tools can collect information and guarantee accurate and timely decisions since data analysis and interpretation speed is enhanced. Apart from the speed of data analysis, accuracy and reliability of such information can also be guaranteed when such tools are used in the supplier selection decision making process.

### 2.4.3 BI Adoption Among Malaysian Companies

The adoption of BI in developing countries such as Malaysia is not limited to particular companies or industries. There are a wide variety of industries in the country that have adopted BI (Boonsiritomachai et al., 2016). Some of these industries include banking, communications, healthcare and manufacturing. However, it is interesting to indicate that adoption of BI in the manufacturing sector is still restricted to large organizations (Pennings and Harianto, 1992; Dyerson et al., 2009, Thong, 1999). This is due to the financial capabilities of these industries and also the technical expertise required in the operation of BI tools and systems (Boonsirithomachai et al., 2016). The implementation of BI is also largely influenced by the varying industrial needs (Hill and Scott, 2004). The same assertion is reflected by the fact that, due to the specific requirements of the relevant industries, different BI tools are available to meet

particular needs of organizations within these industries (Hill and Scott, 2004). For instance, the manufacturing industry can use predictive analytics to identify high potential suppliers within their database.

The supplier identification process is one of the most critical stages of supplier evaluation and selection process in the supply chain management (Boonsiritomachai, et al., 2016). These companies can also use data mining techniques to improve risk management by performing manufacturing risk analysis. Aside from the supplier selection and risk management functions, BI can also prove invaluable in forecasting customer demand on products. Moreover, optimization needs by operations managers can be best achieved by the use of BI techniques and tools (Ong et al., 2011). Operation managers can optimize daily processes and operations by monitoring the usage of resources. These resources can include, but are not limited to, inventory, human resource, financial resources and technological resources (Rajteric, 2010). By facilitating these controls, manufacturing firms are able to eliminate hidden costs (Boonsiritomachai, et al., 2016). From this analysis, it is evident that the presence of BI tools in the Malaysian manufacturing industry is not a new phenomenon. A good number of manufacturing and non-manufacturing firms in the country are already reaping the benefits of adopting BI tools in their operations.

### 2.4.4 Advantages and Disadvantages of Using Business Intelligence Tools

The implementation and maintenance of business intelligence BI have both advantages and disadvantages. SMEs exhibits a great need for the implementation of business intelligence tools as larger companies, but their adoption rates are still not comparative to larger organisations (Gare and Melin, 2011). Business intelligence

provides complex corporate and competitive information to policy makers and planners. The objective of obtaining this information is to improve the quality and timeliness of input to the decision process. For example, the supplier evaluation and selection process requires objective and sometimes-complex information. This information can be best obtained and analysed using BI technology.

Advantages

Business intelligence technology has brought a new efficient and effective way of gathering information from non-computerized sources. Furthermore, before the advent of BI technology, most companies lacked the efficient machines and computing experience needed to examine data properly (Li et al., 2014). BI technology has provided standard and good organizational structure and enabled multi-tasking abilities for business (Tan and Lin, 2012). It has also enhanced the flow of communication networks within organizations. Research shows that business intelligence technology is creative, innovative and faster compared to traditional decision-making tools. This technology comes with improvements to the information and communication systems and helps organizations attain their goals and objectives (Thiruchelvam and Tookey, 2011). The same has enabled many world-class manufacturing firms to achieve their managerial targets and goals. BI is a mechanism for constant use of performance metrics, hence increasing the efficiency of organizations. This technology also simplifies teamwork and the graphical representation of data in a more relevant and applicable manner. From the highlighted facts, it is evident that BI promotes fact-based decision-making in companies and organizations.

With regard to operations management, BI can enhance elimination of waste in addition to promoting lean operations. This is possible as business intelligence can pinpoint areas of loss or waste that might have previously gone unnoticed in large organizations (Watson and Wixom, 2007). This technology can also assist in identifying areas of overlap or inefficiency between departments and subsidiaries (Ndubisi et al., 2004). For example, according to the website of CIO in 200, through the help of business intelligence tools, Toyota realized that it had been double-paying its shippers to a tune of $12,000. Business intelligence technology can also help firms identify opportunities in the market (Oly Ndubisi et al., 2004). BI enables companies to assess and evaluates their capabilities. The same allows them to compare their relative strengths and weaknesses against their competitors. They are therefore able to identify trends and market conditions and hence respond appropriately. Responding to change quickly and adapting to market dynamics are key necessities for gaining a competitive edge in the business environment (Themistocleous et al., 2004). BI tools also help decision makers to respond swiftly and timely to opportunities (Shahgholian et al., 2012). The same can prove invaluable in identifying most profitable customers as well as potentially profitable clients and can also assess the reason for customer dissatisfaction.

### 2.4.5 Disadvantages of Business Intelligence Tools

Despite the highlighted advantages of BI, this technology, just like any other modern technology, has its shortcomings. Some of the deficiencies of BI include piling of historical data, cost, complexity, the muddling of commercial settings, limited use, and time-consuming implementation (Boonsiritomachai et al., 2016; Ndubisi et al., 2004). The piling of past data is a primary goal of business intelligence technology. It is in this

way that the professionals use these piled data to make decisions. On the other hand, the piled information always amounts to a small portion of what firms really need for their decision-making process. In some cases, the user may not actually require historical data as most of the markets that the companies operate with are in frequent alterations. The cost of BI technology is another fundamental limitation to its implementation. The cost of BI at times can be a little too much for small firms, like in the case of SMEs (Boonsiritomachai et al., 2016). For such companies, the use of these systems can be expensive for basic business transactions. The third hurdle for the implementation of BI technology is its complexity. The data used in BI systems can sometimes be so intricate that it can make business techniques rigid to deal with. In view of such premise, many experts from different organizations have predicted that these intricacies can ultimately throttle any given business. BI, like most improved technologies, was initially established with consideration of the buying competence of affluent firms. This is the reason the less prosperous businesses cannot afford BI system (Shen et al., 2012; Negash, 2004). Nonetheless, it is important to indicate that traders in the past few years have started to modify their services towards medium and small-sized industries, although it is still intriguing to realize that such firms do not consider BI technologies to be highly essential, for its complexity (Turban et al., 2008). Finally, time is a critical element of organizations' operations. Many companies today are fast-paced and are not patient and bold enough to wait for the execution of Business Intelligence in their organizations (Turban et al., 2008). For example, it usually takes more than 18 months for a data warehousing system when implementing BI, and this is a substantial amount of time that many firms may not be willing to sacrifice. From the highlighted shortcomings of the technology, it is evident that it is vital for the manufacturing SMEs in Malaysia to give due intelligence when it comes to

the implementation of BI systems. Businesses should, therefore, be made to understand that storing data in the business intelligence system just for the sake of it cannot increase its worth, and on the contrary, can result in a vice versa impact.

### 2.4.6 Problems with the Use of Business Intelligence (BI) Tools

The implementation of Business Intelligence (BI) is sometimes characterized by problems that are contrary to the expectations of policy makers. Whilst many policy makers always blame the problem on faulty software, the reality is that a successful BI project is largely based on a number of factors which are different and far apart from a mere software failure (Negash, 2004). These factors often degenerate into problems (Jamil et al., 2013; Yang and He, 2013). The problem with the implementation and use of BI systems can be grouped into five distinct categories. These categories include: when users don't like the solution, when users are not properly or adequately trained and when users do not want to change (Rasmussen et al., 2002; Boonsiritomachai et al., 2016; Elbashir et al., 2008)

The first common problem with the use of business intelligence tools is the fact that the users may not like the solution (Negash and Gray; 2008; Golfarelli et al., 2004). In the event that the supposed users don't like the BI solution, its implementation can be quite elusive. The given scenario often occurs when the BI tools get selected without input from the users (Elbashir et al., 2008); Jourdan et al., 2008). When the system is finally rolled out, users may find it quite confusing. The BI system, in this case, may not meet the needs of the users, and this may force them to go back to their old ways of doing things (Jourdan et al., 2008). Secondly, when users are not adequately trained, the results can be disastrous (Moss and Atre, 2003; Watson and Wixom, 2007). When users do not understand the tool and how BI can help them they will not

be ready or willing to use it. Apart from refusing to use the tool, users' productivity levels can reduce due to lack of motivation. Lack of knowledge on a particular BI tool can breed frustrations. Workers will feel frustrated when they realize that they cannot use the BI tool, and this can lead to a negative work perception. A demotivated work team can result in losses due to low productivity and negative energy within the workplace (Gangadharan and Swami, 2004; Ashton and Stacey, 1995).

Finally, resistance to change is another critical impediment to the implementation of BI systems (Kettinger and Grover, 1995). Where users do not want change, the implementation process of the adopted BI system can be a challenge (Seah et al., 2010). However, it is important to indicate that resistance to change is a common phenomenon in every company and management must find ways of dealing with this issue (Dent and Goldberg, 1999; Piderit, 2000). Research shows that in any given company or organizational set up, a handful of people will always resist any new technology as they tend to believe that the old technology works adequately (Wixom and Watson, 2012). In order for companies to combat this problem, they must ensure that training is practical (Watson and Wixom, 2007). They must not only explain how the tool works or helps, but they must demonstrate how the tool can solve a problem that they face (Haddock and O'Keefe, 1990). Practical orientation is the best technique required in the implementation of any BI system (Yeoh et al, 2009; Gangadharan and Swami, 2004). For example, management can build a sample report needed by users and then demonstrate its usage in their work environment. These highlighted problems are just a few reasons why a BI system solution might not meet the expectations of policy and decision-makers. Manufacturing companies must look into these pitfalls so as to ensure the implantation process does not fail under any given circumstance.

### 2.4.7 Knowledge Gap in Business Intelligence (BI) Tools

Business intelligence plays a critical role in companies today just as previously mentioned. However, the reality is that with the enormous information and the inherent technological developments going on, it is almost impossible to be completely in-the-know about what is happening in the market they operate in (Cody et al; 2002; Jourdan et al, 2008; Baars and Kemper, 2008; Boonsiritomachai et al., 2016;). This is an important knowledge gap that is indeed not easy to bridge. The void between new developments taking place and what the company knows, exists in all business organizations. Unfortunately, this gap tends to be larger in SMEs and other smaller companies, and these companies tend to be continuously playing catch-up (Azvine et al, 2006; Savioz and Blum, 2002; Azvine et al., 2005). On the other hand, larger companies, because of their resource base and better access to information, can close the gap faster than their smaller counterparts. This means that most of these companies are likely to make decisions with out-dated and less-perfect information.

## 2.5 Artificial Intelligence Tools to Support Supplier Selection Decision-Making

Artificial intelligence tools (AI) were initially introduced to create and develop “thinking machines that are able to learn and mimic and replace human intelligence (Salomon, 1988; Geneserth and Nilsson, 1987; Kalogirou, 2003). AI technology has grown immensely since the late 1970s. It has shown great promise in improving the human decision-making process and subsequent productivity in various business activities (Herschel and Jones, 2005). AI has been used to support the supplier selection decision making process (Claire et al. 2016). Supply chain professionals have realised that artificial intelligence can be ideal in solving practical problems, for example, the

multiple criteria problem that exists in supplier selection decision making (Jamil et al., 2013). Stakeholders of the supply chain, and even the operations management as a whole, have realised that artificial intelligence (AI) can be ideal in solving practical problems relevant to Supply Chain Management (SCM) (Jamil et al., 2013). The process of selecting vendors is one of the most challenging and critical endeavours in any supply chain management task, and this is where AI comes in handy to help solve these inherent problems (Jamil et al., 2013).

The complexity of a supply chain is aggravated more when the industry relies too much on multi-range products, as in the case of the Malaysian manufacturing sector. The situation is even worse when there is a frequent introduction of new products as there is an increase in demand to meet the requirements of different segmented markets (Jamil et al., 2013; Rouyengegh and Erkan, 2012; Canbolat, 2005). This scenario is common in the automotive industry with the frequent introduction of new models and shorter product lifecycles. This situation is then compounded by the fast order delivery, which requires a high level of flexibility and agility of suppliers. These demands aggravate the vendor selection complexity. Hence, the right supplier evaluation and selection becomes more complicated (Canbolat, 2005). However, with the mounting complexity of the supply chain, the selection of vendors continues to be more complicated and demanding, and this is where artificial intelligence tools can prove invaluable in meeting supply chain goals and objectives (Johnson, 1994). In Malaysia, some leading companies have employed artificial intelligence in their operations (Deswal and Garg, 2015).

According to Deswal and Garg (2015) the selection of a suitable supplier has always been a challenge for many manufacturing companies. Deswal (2015) argues that

vendor selection is a multi-criteria decision-making problem, and requires stakeholders to deal with the inherent uncertainty and complexity appropriately. The artificial intelligence techniques can help address these risks better and more efficiently.

Research into the current area has also identified the supplier selection decision-making process as a multi criteria problem, and many solutions and frameworks have been developed to tackle these problems. The following table is a synthesis of artificial intelligence tools used to support the supplier selection decision-making process.

| Model types | Reference | Structures of criteria | Types of criteria | Criteria aggregation | Comments |
|---|---|---|---|---|---|
| **Mathematic programming** | Haiidimitriou and Georgiou (2002) | Three levels | Quantitative | Linear aggregation | Be able to achieve multiple goals for different levels of performance of the corresponding attributes. |
| | Talluri and Baker (2002) | Flat | Quantitative | MINMAX technique | Built a 3-phase approach combining with pairwise efficiency game model with the risk producing a suboptimal solution. |
| | Ip et al. (2003) | Flat | Quantitative | Linear aggregation | Considered both costs and due dates, which are quantitative measures only. |
| | Humphreys et al. (2003) | Flat | Quantitative | Linear aggregation | Proposed a mechanism for evaluating supplier involvement during product development which could reflect the potential risk involved in a project. |
| **Analytic hierarchical process** | Babic and Plazibat (1998) | Hierarchical | Quantitative | Relative score comparing | Rank candidate firms based on multiple business efficiency indices such as profit margin and debt ration. |
| | Mikhailov (2002) | Hierarchical | Quantitative & Qualitative | Relative score comparing | Extended AHP to cope with the fuzziness yet the method only considers one-way hierarchical relationships between the factors. |
| | Sarkis et al. (2007) | Network | Quantitative & Qualitative | Supermatrix raising | Built a strategic ANP model to overcome the problem of rank reversal, yet the final solutions may not be clearly defined without incorporating secondary criteria. |
| **Fuzzy set theoretic analysis** | Lin and Chen (2004) | Four levels | Quantitative & Qualitative | Fuzzy relationship hierarchy | Highlighted the importance of formulating evaluation criteria while constructing a fuzzy decision-making framework. |
| | Sarkar and Mohapatra (2006) | Flat | Quantitative & Qualitative | Fuzzy set approach | Measure the imprecision to rank and reduce the number of potential suppliers into the 'motivated' and 'de-motivated' ones by focusing on their performance and capability. |
| | Bevilacqua et al. (2006) | Flat | Quantitative & Qualitative | Fuzzy suitability index (FSI) | Use both internal and external variables to rank the potential suppliers by transforming decision-makers' verbal assessments to linguistic variables. |
| **Other methods & models** | Talluri et al. (1999) | Flat | Quantitative | DEA analysis | Appropriate for sorting large sets of potential options while suffering from the drawback of low discrimination power. |
| | Dulmin and Mininno (2003) | Flat | Quantitative | PROMETHEE method | Rank alternatives and analyse the relationships between different criteria. A shortcoming is the difficulty of determining what weightings should be given to the various criteria. |
| | Sha and Che (2006) | Hierarchical | Quantitative | Genetic algorithm | Proposed an approach to satisfy simultaneously the preferences of the suppliers and the customers at each level in the network. Outperform that of the single-phase genetic algorithm in supplier selection. |
| **RBF-ANN** | Proposed approach | Hierarchical | Quantitative & Qualitative | RBF activation function | Considering both quantitative and qualitative measures, propose RBF-ANN model to classify the potential suppliers into several categories with self-learning and fault-tolerant ability. |

*Table 2.2 The above table represents research in artificial intelligence, which provides support for the supplier selection decision making process.*

In this given context, vendor selection becomes an important part of supply chain systems as reflected in the above Table 2.2. This also confirms the claim that vendor selection strategy is the central function of the procuring departments in an organization. However, a supplier selection criteria is a multi-criteria decision-making process and can be either qualitative or quantitative. However, research confirms that the conventional methods for supplier selection are inadequate to express linguistic terms, which can be imprecise or vague in nature (Deswal, 2015). This is the reason the use of fuzzy logic and artificial intelligence technique has increased to overcome these limitations. Artificial intelligence, therefore, plays a critical role in the modern supplier selection decision-making process (Percin, 2006; Zouggari et al., 2012; Shen et al., 2009; Spangler, 1991). The use of AI helps offset the uncertainty in supplier selection that comes with the vagueness of the entire system (Smolova and Pech, 2012). The fuzzy set theory alone is inadequate in dealing with the inherent challenges (Laviolette et al., 1995). For that reason, there is a need for techniques, which can consider the use of multiple criteria for supplier selection, and hence more future research is necessary.

From the facts highlighted above and Deswal and Garg (2015) arguments, it is evident that supply chain artificial intelligence offers wisdom to the supply chain management. The use of artificial intelligence in supplier selection is one of the new trends in supply chain management systems of many manufacturing firms (Kahraman et al 2003; Choy et al., 2002). The use of simulated computer imagery to enhance production and efficiency through appropriate supplier selection methodology is critical to the functionality of any supply chain management system. Nevertheless, it is interesting to note that supply chains in most cases tend to forget how augmented reality can

naturally transform the entire supply chain. Supply chain artificial intelligence is one of the main driving forces behind the supply-augmented reality.

Currently, artificial intelligence tends to be everywhere, and this explains its rise in application in supply chain management. Moreover, artificial intelligence is poised to change supply chain systems radically in a manner that has never been witnessed before (Boonsiritomachai et al., 2016). The use of computer software in decision-making and interaction with human capabilities is an essential tool for decision-makers not only in the manufacturing sector but also in all dimensions of society (Choy et al., 2003) The AI, therefore, presents an opportunity for filling the knowledge gap in decision making (Schmidt et al., 2001). One would wonder what the drivers of artificial intelligence are in the contemporary business society. However, the need for increased speed in decision making and consumer demand are the key drivers of artificial intelligence (Mehrabi et al., 2000). For example, the limitations of the fuzzy models in the supplier selection process can be complemented by the use of AI (Deswal and Garg, 2015). Artificial intelligence has both advantages and disadvantages. Benefits include the continuous operation of machines without losing memory or tiring (Jegou and Terrioux, 2003). The ability to improve the exchange of information across functional areas of the supply chain systems is another advantage of AI. However, the disadvantage of AI includes the possible breakdown of critical components of the AI systems (Angeles and Nath, 2000). This breakdown can lead to run down time, machines and workers are likely to remain idle during a breakdown, and this can result in hidden costs. Finally, the rising cyber security fears hinders full implementation of the AI system without adequate security backups.

### 2.5.1 Knowledge Gap in the Application of Artificial Intelligence on Supplier Selection

Researchers believe that artificial intelligence is on the verge of transforming the way people do business. Artificial intelligence is indeed moving from the research lab into the business, professional and industrial application. Nonetheless, the system is still a long way from gaining the extravagant claims that many have made for it. More needs to be done in this area of technology so as to achieve the practical aspect of technology (Saloman et al., 1991). Another inherent knowledge gap in the implementation of AI system is the inability of policy makers to recognize the unique problems of deploying AI (Malhotra, 2004). Furthermore, there is much confusion about the use of AI from unconscious beliefs about intelligence.

Research in AI, has more commonly used a quantitative method or mixed methods, using secondary data to support theories (see table 2.2). Due to this, the practicality and suitability of specific firms are not taken into consideration, with respect to the process and supplier selection criteria. Thus far, there are a handful of studies that approach this area with empirically (Kusiak, 1987; Kusiak, 1988; Walsham, 1995; Stefik et al., 1982; Nau et al., 1995; Parunak, 1996). However, these studies, were not solely based on the selection of criteria for the decision making, therefore presenting a gap, to involve more empirical studies, to assess the main supplier selection criteria, and investigate policies, company structure, company size, and other factors that influence and affect supplier selection criteria.

## 2.6 Justification of Malaysia

Malaysia is a newly industrialized market economy and has presented itself as one of the fastest growing economies in Asia (Wade, 1990; Bloom et al., 1998; Ozawa; 1992). The economy is relatively open and state oriented just like most of the Asian economies, which makes this interesting. The economy of Malaysia is the third largest in South Asia after the more populous Thailand and Indonesia, and it is the third richest country in South Asia by GDP per capita value (Vadra, 2015). The Malaysian economy is hugely driven by manufacturing and is one of the most competitive in the world (Quinn, 1992). Moreover, it is important to indicate that the country's economy is hugely dependent on manufacturing SMEs, and this sector has contributed massively to the success of the country's external trade (Meyer, 2004). The industry sector accounts for more than 36.8%, which is more than a third of the country's GDP and employs 36% of the labour force according to statistics released by the Department of Statistics in 2012. However, the industrial sector is mostly contributed to by the automotive industry, construction industry, and electronic industry. The highlighted facts justify the reason why Malaysia is an important area of study when it comes to manufacturing process and operation. The gradual but consistent growth of the country's industrial sector and the role of SMEs in this development is intriguing and can act as a benchmark through which developing countries can stimulate industrialized economic growth.

### 2.6.1 The Influence of the Malaysian Culture on Supplier Selection Decision-Making Process

The Malaysian culture is a component of Chinese culture, Indian culture, Eurasian culture and the culture of the indigenous groups of the peninsula and North Borneo

(Watson, 1980). A unified Malaysian culture is but an emerging trend of a national culture between the Malay and non-Malay (Carstens, 2005). These groups are represented by two groups, including the Chinese middle class, whose prosperous lifestyle has led to a Malaysian shift to a consumer society (Smith, 2003). During the process of supplier selection, there is a need for organizations to analyse the cultural orientation and family ties (Zahra et al., 2004; Schein, 1989). This applies to family virtue and relationships that in some cases influence the preference for choosing a supplier. Moreover, family virtues and norms in Malaysian have a huge impact on how businesses operate in mainstream society (Budhwar and Fadzil, 2000). The supplier selection process is an important activity and one that aids in making and building a strong supply base. By selecting a single vendor that meets certain preferred criteria, the purchasing department plays the role of a gatekeeper (Mc Cutcheon and Stuart, 2000). However, other factors influence the choice of a supplier apart from the traditional evaluation criteria. Malaysia is a country with a culture of relatively strong family ties (Javidan and Dastmalchian, 2003). For that reason, for family businesses and other SMEs, family preference is a common phenomenon. Suppliers of smaller business and even the larger corporation would not mind giving preference to the vendor during the supplier selection process. (Javian and Dastmalchian, 2003). However, goal oriented businesses must also look at the traditional requirements highlighted above, that is, quality, delivery time and price. Secondly, ethical culture is another important cultural dimension when it comes to the supplier selection process (Mamic, 2005). The perception of what constitutes right and wrong is an important cultural aspect in Malaysia. The sole compliance with legal regulations was the fundamental concern of ethical professional behaviour for a long time. However, today business practices go beyond mere legal requirements and compliance with the legal

rules and are shaped by expectations of numerous stakeholders (Carroll (1998). Furthermore, despite the development of globalized markets, with standardized marketing activities and products, marketers must be aware of the various environmental differences that have to be addressed when conducting supplier selection (Handfield et al., 2002; Handfield, 2005). This situation is true for the South East Asian countries that have their own distinctive, regulations, norms, cultures, norms and languages. Different religious beliefs also define ethical conducts, and are a determinant ethical code of conduct when it comes to the supplier selection process (Conroy and Emerson, 2004).

Finally, social forces within society have various social/cultural aspects that can have an enormous impact on how a company can conduct the supplier selection process. The Malaysian cultural norms, language diversity and family beliefs among ethnic groups have an impact on the supplier selection process (Bhaskaran and Sukumaran, 2007; Haniffa and Cooke, 2002). The purchasing departments of the manufacturing SMEs must, therefore, understand the cultural dimension of the society when conducting supplier selection (Humphreys et al., 2004). The adherence to cultural norms and what constitutes ethical codes of conduct with the community is ideal for designing the best supplier selection criteria. The same applies to Malaysian manufacturing SMEs (Wickert, 2010).

## 2.7 Summary of gaps

### 2.7.1 Supplier Selection Decision-Making

There is a need to understand the supplier selection decision-making process as a holistic process, and not specific to company performance as current literature emphasises (De Boer, 1999; Ellram, 1996; Kannan and Tan, 2002).

There is a need to explore and investigate supplier selection decision-making processes in developing countries. SEA is viewed as a prominent area for manufacturing, with a lack of research in supply chain management research. Research is encouraged to be conducted in these countries (Cooper and Lambert, 1998; Zailani et al., 2012; Tahriri et al., 2008).

There is a need to conduct research in a qualitative manner, as this type of research gains insight into the supplier selection issues and problems, thus encouraging solutions. Practitioners in the industry would be made aware, and can factor in other issues for their solutions.

### 2.7.2 Information Technology

Information technology has proven its beneficial support to the supplier selection process; however, the tool is viewed as being underutilised. Literature indicates the usage of E-procurement as the main tool used by manufacturing companies to support supplier selection (Cheragi et al.2011; Davilla et al., 2013). However, practitioners and researchers can benefit from an exploratory study into the usage and presence of information technology tools in developing countries, such as Malaysia, to uncover

other tools used for supporting the information technology process. Information technology literature is positioned on company performance when integrating information technology tools. An exploratory study would benefit from inquiring into other reasons for the implementation of information technology tools.

### 2.7.3 Business Intelligence Tools

Business Intelligence (BI) literature is positioned as being beneficial and is utilised by organisations for organising their data. However, there is a clear gap as literature indicates a lack of awareness of the tools being used by all industries (Cody et al; 2002; Jourdan et al, 2008; Baars and Kemper, 2008; Boonsiritomachai et al., 2016). Significantly, SMEs are viewed to always be playing “catch up” with technology, as the larger companies are viewed to be on the forefront of the implementation of BI tools. There is a need for an investigation into the usage and presence of the business intelligence tools in SMEs, and in developing countries, such as Malaysia (Azvine et al, 2006; Savioz and Blum, 2002; Azvine et al., 2005).

### 2.7.4 Artificial Intelligence Tools

The amount of papers that focus on artificial intelligence support of supplier selection decision-making tools are vast, but the focus of this research is placed on developed countries, such as: USA, Europe, France, and Australia. Studies assume that all manufacturing countries are aligned. However, Saloman et al., 1991, states that there are reasons to believe that for SMEs the current state of AI is not similar to the presence in larger firms. Also there are other factors to consider in SMEs especially in

developing countries. The literature presents a gap to explore the usage and presence for AI tools.

Taking into consideration the aforementioned gaps and calls in literature, the following research questions have been developed:

- To investigate the supplier selection decision making process in Malaysian manufacturing.
- To explore the usage and presence of information technology tools that supports the supplier selection decision-making process.
- To explore the usage and presence of business intelligence tools that supports the supplier selection decision-making process
- To explore the usage and presence of artificial intelligence tools that supports the supplier selection decision-making process.

Subsequently, a theoretical framework has been formed that guides the course of this research project (Figure: 2.1)

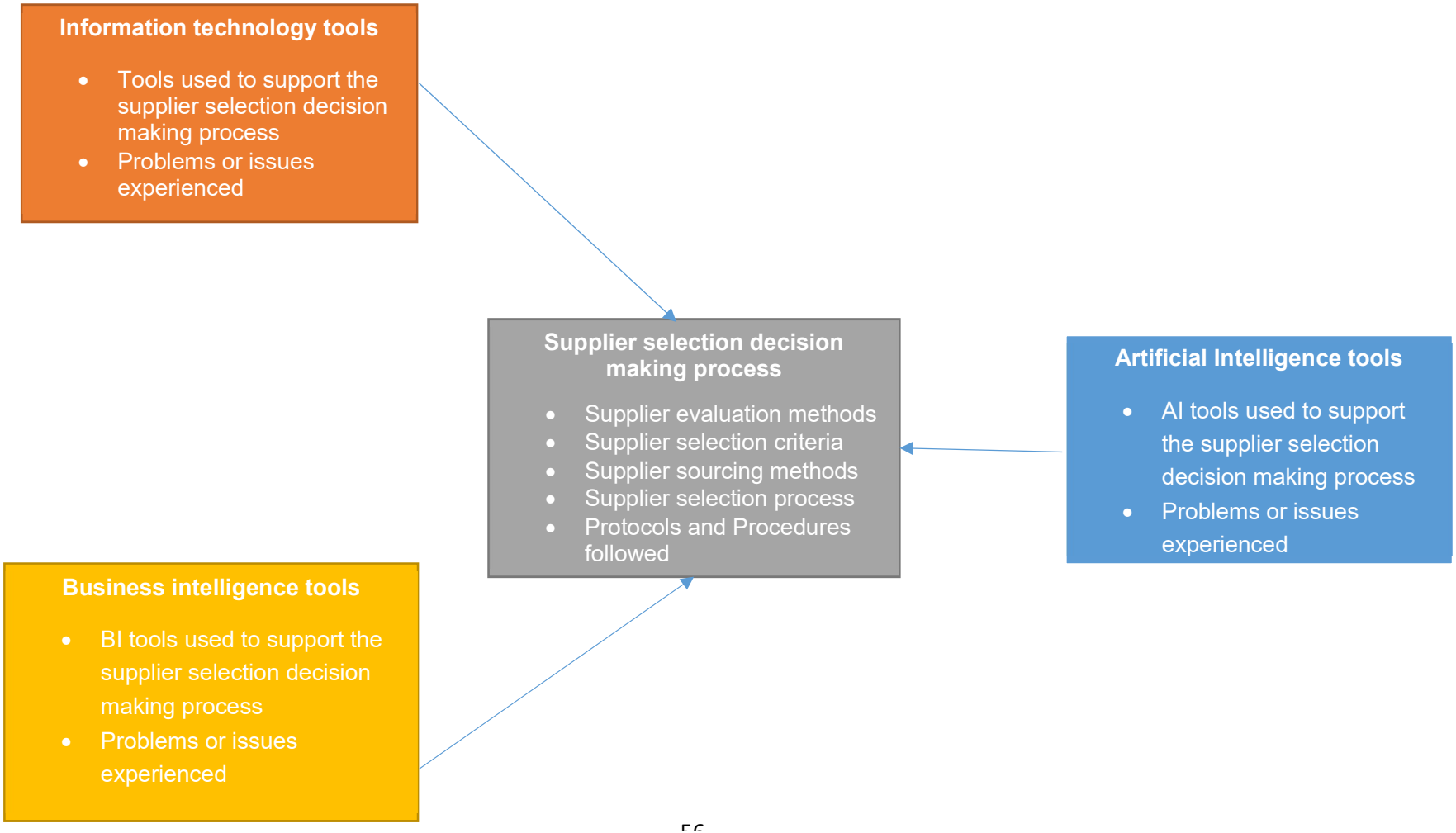



*Figure 2.1 : Theoretical framework*

### 2.7.5 Conclusion

From this literature review, it is evident that after many decades of industrialization in Malaysia, the manufacturing industry has moved towards achieving higher value-added activities. The changes are evident in the manner in which manufacturing companies put a lot of emphasis on their operations management. However, supply chain systems remain at the centre of the operations, and functions such as supplier evaluation and selection processes are the embodiment of the supply chains systems of these firms. The inherent complexity of manufacturing operations of companies in Malaysia calls for integration and adoption of emerging technologies in supplier selection such the use of Business Intelligence (BI) and Artificial Intelligence (AI) into the traditional methods such as the fuzzy logic. With the right supplier selection criteria, manufacturing companies in Malaysia are expected to gain a competitive advantage in the manufacturing firms not only in Asia but also in other parts of the world. The need to get a competitive edge by the elimination of waste and hidden costs has driven most of the manufacturing SMEs to implement lean operations even in their supplier selection decisions. Finally, the highlighted research gaps in every section of the paper is not exhaustive; it is important to note that research into supplier selection is commonly carried out in Western countries and not in Eastern countries. This trend presents myriads of challenges when it comes to supplier selection decision-making by organizations and companies in Malaysia and other parts of South East Asia.

# Conceptual Framework

## 2.8 Introduction

This section presents the theoretical foundation that underpins the theoretical framework of this study. The theoretical framework has four components, including supplier selection decision-making process, business intelligence tools, information technology tools and artificial intelligence tools.

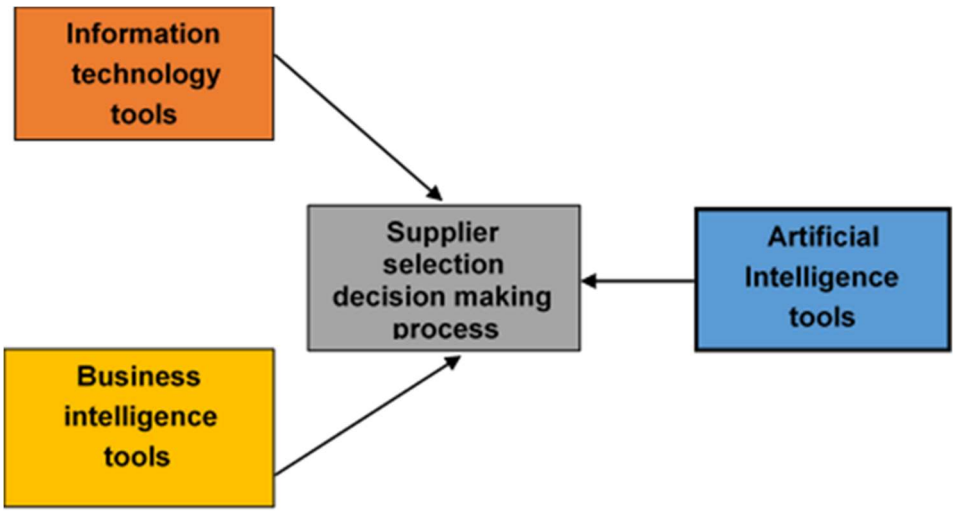



*Figure 2.8.1 Theoretical framework*

### 2.8.1 Supplier Selection

Dickson (1966) and Weber et al., (1991), sets the main elements for supplier selection criteria, including price, quality, delivery, performance, history, capacity, communication system, supplier relationship management service, financial and management capability, geographical location and a few others. The determining factor for the appropriate criteria is usually in the first phase of the selection process. In the context of manufacturing in Malaysia, the supplier selection decision-making process contributes to the supplier evaluation, supplier audit process, and the method of sourcing. Therefore, it is important to put emphasis on the supplier selection, which leads to the selection of the “right suppliers”.

Earlier researchers, focused on identifying essential criteria to the industry, (Dickson, 1966, Lehmann and O’Shaughnessy,1982). Their studies cover the supplier selection decision-making process in several situations, including, a single vs. multiple sourcing, direct versus indirect, strategic buyer relationships and strategic non-buyer relationships.

Verma and Pullman (1998), examined whether the criteria for supplier selection are comprehensible with the perception of firms. Although, quality was established as the most critical criteria, the actual selection of deciding factors was based on cost and delivery time.

De Boer et al., (1998), categorises the supplier selection process into “new task situation”, “modify rebuy” and “trial buy”. The research distinguishes the variance of complexity with the three situations, but states that these situations can change because of the way people interact with a particular situation due to years of experience in purchasing.

In research, various methodologies have been applied to the supplier selection multiple criteria problem (see table 2.3). These studies have indicated that although cost is key criteria, other criteria such as quality, delivery and service are also applied. Although, these criteria are highlighted as the most important to firms, research is still called upon to investigate into this situation as these criteria are not relevant to all firms.

| Process | Area of Research | Reference |
|---|---|---|
| **Supplier selection process / supplier selection criteria** | • Integrating environmental criteria (quantitative)<br>• Company performance using quality, cost and performance. (quantitative)<br>• Company performance using quality, cost and delivery time (quantitative)<br>• Company performance using 23 criteria (Dickson, 1966) (quantitative)<br>• Company performance using, cost delivery time, flexibility and service (quantitative) | Humphreys et al., (2003)<br>Ghodsypour and O'Brien (1998)<br>Sanyei et al., (2010)<br>Kahraman et al., (2003)<br>Van der Rhee et al., (2009) |
| **Supplier evaluation** | • Individual approaches (quantitative)<br>• Individual approach (quantitative)<br>• Individual approach (quantitative) | Ho et al., (2010)<br>Chen et al, (2006)<br>Pearson and Ellram (1995) |
| **Supplier sourcing** | • Trade fairs (local and international)<br>• Magazines | Ganesan et al., 2009<br>Van der Vorst & Beulens, 2002 |
| **Protocols and procedures** | ISO 9001 | Van der Vorst & Beulens, 2002; Brown et al., 2005; |

Table 2.3 Conceptualisation of Supplier Selection

This study attempts to include a holistic overview in the supplier selection process, looking at the supplier selection criteria, supplier evaluation methods and the sourcing methods of new suppliers.

### 2.8.2 Information Technology

Research states that information technology plays a beneficial supporting role to the supplier selection decision-making process. However, current literature only identifies E- Procurement as the main information technology tool used.

Subramani (2004), research focuses on the implementation of information technology and its relationship with exploitation and exploration for operational benefits with strategic benefits to result in competitive performance.

Tracey and Tan (2001) relate to performance studies when integrating information technology tools and position their research on customer satisfaction. Stump and Sriram (1997), again focus their research on the efficiency and effectiveness of information technology and on buyer/supplier relationships. However, there is a significant lack of research that presents the full exploitation of information technology to support the supplier selection decision-making process, especially, in manufacturing firms based in developing countries like Malaysia.

Finally, in the reporting of issues and problems with the usage and presence of information technology tools, studies mostly report issues with training, and legal implications. It can be suggested that, if there is a lack of exploitation of the usage of information technology tools in Malaysia, it can be extended to the lack of reporting of issues and problems with the usage of information technology tools.

| Process | Practice | Reference |
|---|---|---|
| **Tools used to) support the supply selection decision making process** | E- Procurement | (Cheraghi et al., 2011) Davilla et al., 2003; |
| | E- Supplier | Wymer and Regan, 2013; (Presutti, 2003 |
| **Issues or problems experienced** | Resistance to change | Wymer and Regan, 2013; (Presutti, 2003 |
| | Lack of technical ability | Mastor, 2010; |
| | Legal issues | Lambert et al., 1998 |

*Table 2.4 Conceptualisation of Information Technology*

This study aims to investigate and explore the current usage and presence of information technology tools. As the conceptualisation table (2.4) indicates, the most common usage of information technology tools is E procurement and E-Supplier tools. This research will investigate the usage and presence of these tools in Malaysian manufacturing companies. The research also lists the most common problems or issues experienced as resistance to change and a lack of technical ability and legal issues. The objective of this research is to uncover the issues and problems experienced in Malaysian manufacturing companies.

### 2.8.3 Business Intelligence Tools

Research into the integration of business intelligence tools to support the supplier selection decision-making process is viewed as a beneficial tool to help support and organize information, for an effective and more informed decision-making (Ghosal and Kim 1986; Gilad and Gilad 1986; Lonngvist and Pirtomaki, 2006).

However, the literature identifies most tools being used as being developed to meet the needs of larger organisations in developed countries such as USA, Europe, France, and the UK Ong et al., (2011).

Boonsiritomachai et al., (2016), highlights the current presence of BI tools as, Cognos, SAP, IBM, Oracle, SAS Information Builders, Micro Strategy and Microsoft. However, the scale of BI tools installed or implemented in a given organization depends on the user requirements and the business problems. For that reason, organizations can adopt different types of BI depending on their business problems and technological capabilities (Medjahed et al., 2003).

The first common problem with the use of business intelligence tools is the fact that the users may not like the solution (Negash and Gray; 2008; Golfarelli et al., 2004). In the event that the supposed users do not like the BI solution, its implementation can be quite elusive. The given scenario often occurs when the BI tools get selected without input from the users (Elbashir et al., 2008); Jourdan et al., 2008). When the system is finally rolled out, the users might find it quite confusing. The BI system, in this case, may not meet the needs of the users, and this may force them to get back to their old ways of doing things (Jourdan et al., 2008). Secondly, when the users are not adequately trained, the results can be disastrous (Moss and Atre, 2003; Watson and Wixom, 2007). When users do not understand how the BI tool can help them they will not be ready or willing to use it. Apart from refusing to use the tool, users' productivity level can reduce due to lack of motivation. The lack of knowledge on the particular BI tool by the users can breed frustrations. The workers will feel frustrated when they realize that they cannot use the BI tool, and this can lead to negative work perception. A demotivated work team can result in losses due to low productivity and

negative energy in the workplace (Gangadharan and Swami, 2004; Ashton and Stacey, 1995);

Finally, resistance to change is another critical impediment to the implementation of BI systems (Kettinger and Grover, 1995). Where users do not want change, the implementation process of the adopted BI system can be a challenge (Seah et al., 2010).

This research aims to explore the business intelligence tools used to support the supplier selection decision-making process. The current literature positions business intelligence tools in use and practice in developed countries and highlights a gap in ascertaining the usage in SMEs in developing countries. The literature also supports that different firms implement BI tools to meet the needs of their organisations, but in many cases, available tools are not suitable for each organisation. In terms of usability and the ability to integrate departments. This study will uncover the issues and problems with the implementation of business intelligence tools, discover its suitability and what criteria was used to make the final choice for the selection of the business intelligence tool.

### 2.8.4 Artificial Intelligence

The artificial intelligence tool (AI) was initially introduced to create and develop “thinking machines that are able to learn and mimic and replace human intelligence (Salomon, 1988; Geneserth and Nilsson, 1987; Kalogirou, 2003). As the supplier selection decision-making problem is viewed as a multiple criteria issue, the integration of artificial intelligence tools offers solutions. However, the usage and presence of artificial intelligence tools in the manufacturing industry, especially in SMEs are still uncovered. The literature does not consider the firms using these tools,

but presents solutions to solve issues. Due to the complexity of AIs, suitability and practicality is not taken into consideration. The literature review of this thesis highlights solutions and methods offered by researchers (see Table 2.2). This research does investigate the usage and presence of artificial intelligence tools in Malaysian manufacturing and additionally, the issues surrounding suitability and practicality of the manufacturing sector in Malaysia.

### 2.8.5 Conclusion

The focus of this chapter was to present and position the research by presenting a theoretical framework. It began with a description of the first component of the theoretical framework - supplier selection. In accordance with the literature, the highlighted studies have focused on quality management and company performance when addressing the supplier selection problem. In addition, this chapter presents the relationship between these researches and the supplier selection criteria used to support the findings. This research project, aims to explore the holistic supplier selection process in Malaysian manufacturing, considering the supplier selection process, the supplier evaluation methods, supplier sourcing, and the supplier selection criteria. Next, the chapter proceeds with positioning the research with information technology. The concept is presented in the literature as the usage of two main tools, and presents the problems and issues with the implementation of these tools to be limited to resistance to change, lack of technical ability and legal issues. The aim of this research is to firstly, uncover the information technology tools used by Malaysian manufacturers and to ascertain the problems and issues surrounding this phenomenon. Next, the chapter presents the third component to the theoretical framework - business intelligence tools. Current literature positions the usage and

presence of these tools as being used throughout developed countries, and there is a lack of awareness of developing countries using these tools. This research is positioned at exploring the usage of business intelligence tools in Malaysian manufacturing, and uncovering the issues with the implementation of business intelligence tools. Finally, the chapter presents the final component to the framework, and its position to the existing literature, as being widely used in larger firms, to support the decision-making process. However, the tool is defined as being complex and complicated. The objective of this research, is to explore the usage of artificial intelligence tools in Malaysian manufacturing, and to uncover the issues and problems in using the tools.

Chapter three will outline the research approach of this study.

# Chapter 3: Research Methodology

## 3.1 Introduction

This chapter introduces, justifies and discusses the rationale for the methodology used in this study. In order to provide a deeper understanding and a rich description of the information technology, business intelligence and artificial intelligence presence and usage in Malaysian manufacturing supplier selection process, this research adopts a qualitative approach.

This equates with an ontological and epistemological stance to investigate the aims and objectives and generate insights regarding the supplier selection process in Malaysia. Accordingly, this data theory follows three phases of the case study protocol as indicated by Eisenhardt (1989). The first phase of the case study protocol, the researcher explains the method used in developing the research instruments (interview questions).

The second phase of the case study protocol is concerned with entering into the field of data collection and the methods adopted, which are interviews. This will be discussed further, and a justification for the choice will be provided. The analysis phase, specifically the methods, strategies, techniques and tools used in analysing the data from the fieldwork is considered, and the way in which the findings have answered the research questions and validated the proposed conceptual model developed in Chapter Three is shown. The use of qualitative computer software NVivo 10 also helps organise and store the data more systematically which, in turn eases the analysis process. Additionally, this chapter introduces the main criteria, procedures and strategies to ensure the trustworthiness of the research, essentially, aiming to generate credibility, conformability, transferability and dependability of the results.

Being aware that the data collection involves people in the field of Malaysian manufacturing and organisations, the researcher follows the ethical guidelines for research as required by the University of Westminster. Confidentiality of the participants is ensured at all times.

The third phase of the case study protocol is reached when the researcher finds that no new information is forthcoming from the interviewees, and that effectively theoretical saturation is achieved. At this stage, the researcher will conclude the findings, revise the conceptual framework and develop a revised model.

In this chapter, the researcher will also provide a figure illustrating the research design in order to provide a clear explanation of how the research is performed. The chapter finishes with a short conclusion.

## 3.2 Research Philosophy

The first part of this chapter outlines the research's philosophical stance. For empirical research in social sciences to be successful, it should begin with a properly articulated philosophical base as this provides a crucial starting point for all social sciences research. It is important to highlight that research philosophy is about the way in which people view the world, how they consider knowledge and truth and hence issues concerning ontology and epistemology are paramount in social sciences.

Saunders et al (2009), notes the important differences seen in these respects, which influence the way of thinking about the research process. Ontology refers to "the researcher's view of the nature of the reality or being" (Saunders et al., 2009, p.119), this being concerned with assumptions or claims about what exists, what it looks like, what it is comprised of, and how the elements that do make it up interact with each other (Blaikie, 1993). Moreover, epistemology is known as the "researcher's view

regarding what constitutes acceptable knowledge" (Saunders et.at., 2009, p.119) and is therefore, concerned with what represents acceptable knowledge in a particular field of study.

Saunders et al (2009) states that there are four types of research philosophy in management research: positivism, realism, interpretivism and pragmatism.

For this study, the researcher's philosophical stance favours an interpretivist approach in order to explore the presence and relationships between the supplier selection decision-making process and information technology, business intelligence and artificial intelligence in Malaysia manufacturing. This approach is suitable for the researcher as it allows the researcher to have a deep understanding of the situations and phenomenon under investigation.

The study considers the area and the deepness of the research carried out, an interpretivist epistemological approach is taken in this research in order to shed light on and understand the how Malaysian manufacturers select their suppliers, both new and existing suppliers, the supplier selection criteria, and their relationship with information technology tools, business intelligence tools and artificial intelligence tools and technologies. This approach allows the researcher to undertake this study in the natural setting and interpret the phenomena for the theory building (Denzin and Lincoln, 2005).

Walsham (2003) argues that the main benefit of conducting an interpretive study is an expansion of the understanding of the subject under research, rather than figuring out numbers and percentages about the phenomena. Walsham (2005), also supports interpretivism in the field of information systems, operations and management studies,

as it provides evidence of a non-deterministic perspective; an intent to increase understanding of the phenomena within a specific cultural and contextual setting.

At the initial stage of the research, the researcher uses the theory to understand the related phenomenon to research the problems, the weaknesses in the area of research and to identify the gaps from previous research and studies conducted in this field. This allowed the researcher to develop a conceptual model, to describe the relationships between the supplier selection decision-making process, ICT, BI and AI tools and technologies.

The next approach taken is either to adopt an inductive or deductive approach in gaining insight into the subject of investigation. The inductive approach intends "*to learn about the phenomena in question by applying a "less structured" methodology to gain richer and deeper information. Instead of formulating a hypothesis, inductive research try to keep their minds open for any possible results (no pre supposition) whilst proposing a set of further step for data collection in attempt to answer the phenomena in question"* (Sutrisna, 2009).

The inductive approach contrasts with the deductive approach which "entails the development of a conceptual and theoretical structure prior to its testing through empirical observation (Loose, 1993). Thus deductive research conventionally "*commences by analysing literature, i.e. studying existing works in the field providing the context for the research, continues by identifying and stating a single selected problem leading to the isolation of the major research questions in with the existing knowledge may be inadequate"* (Sutrisna, 2009). Table 3.1 below, shows the differences between Deductive and Inductive Approach to Research.

| Deductive Emphasis | Inductive Emphasis |
|---|---|
| • Scientific principles | • Gaining an understanding of the meanings humans attach to events |
| • Moving from theory to data | • A close understanding of the research context |
| • The need to explain causal relationships between variables | • The collection of qualitative data |
| • The collection of quantitative data | • A more flexible structure to permit changes of research emphasis as the research progresses. |
| • The application of controls to ensure the clarity of the definition | • A realisation that the researcher is part of the research process |
| • The operationalisation of concepts to ensure the clarity of definition | • Less concern with the need to generalise |
| • A highly structured approach | |
| • Researcher independence of what is being researched | |
| • The necessity to select samples of sufficient size in order to generalise conclusions | |

Table 3.1 Major Differences Between Deductive and Inductive Approaches to Research

**Source: Saunders et al. (2009) p.127**

The main difference between deductive and inductive research lies on the use of the current body of knowledge and the role of the data collection. "*Researchers performing deductive research compose hypothesis based on the current body of knowledge and then conduct data collection and data analysis to test the hypothesis. Researchers performing inductive research, conduct data collection and data analysis to come up with findings whilst using the current body of knowledge to inform their data analysis when they see appropriate* (Glaser, 1978).

It is important to note that when undertaking an "inductive *approach, it is more likely to work with qualitative data and to use multi methods in collecting data in order to establish a rich understanding of the phenomena*" (Easterby-Smith et al., 2008). Moreover, another important aspect considered when selecting the inductive approach was rigour. In operations, management and logistics research, rigour is significant in both quantitative and qualitative research (Keller, 2002; Ellram, 1996; Golicic et al., 2002).

Gammelgaard (2004), states that the philosophy of the researcher is central in adopting the necessary research approach, method and analysis which will allow the research to adopt the necessary rigour in the research process.

Mentzer and Flint (1997), states that rigour is "*an essential concept in research, and implies care in avoiding inadvertently concluding something the research did not actually reveal*." This current research applies replication logic, comparing all the cases with each other until saturation is reached (Eisenhardt, 1989; Miles and Huberman 1994). In performing the replication logic, this will allow the researcher to build a theory from rich data.

To gain an in depth understanding of the supplier selection decision-making process, the presence of ICT, BI and AI tools in Malaysian manufacturers, an inductive approach was most suited. Paulraj et al., (2008) supports that research conducted in operations management and supply chain management or any other areas where relationships are to be explored, should undertake an inductive approach. This approach allows the researcher to probe and question deeper into the phenomena.

By adopting the inductive approach, qualitative study, the researcher is able to gain a deep understanding of the supplier selection process, to identify the ICT tools used to support the supplier selection decision-making, the ICT, BI, and AI presence in supplier selection in Malaysian manufacturing and other issues or problems in these areas. A clearer understanding and rich data could be gathered through in-depth investigation through the cases.

## 3.3 Research Methodology

Glaser (1992; p.7), defines methodology as the theory of methods and gives an audience a better understanding of previously conducted research and how to proceed in the future. To accomplish the aim and objectives of this study, a qualitative methodology was undertaken, by adopting a case study method to gather rich information and an insight into the phenomenon.

According to Denzin and Lincoln (2005;p.3) qualitative research means "*a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that make the world visible".* Miles and Huberman (1994, p.1) review qualitative research as a "*source of well-grounded, rich descriptions and explanations of process in identifiable local context*." In other words, qualitative researchers study things in their environment, to understand and grasp phenomena in terms of the

meanings people bring to them. Denzin and Lincoln (1998) state that any qualitative inquiry must be associated with a research paradigm whether it is a positivist or interpretive nature and relating the qualitative data to a research paradigm will strengthen the validity of qualitative research.

In past research in the field of supply chain management, logistics, operations and production management it has been noted that the empirical research has been conducted in a quantitative approach (Mentzer and Kahn, 1995; Mentzer and Flint, 1997; Flint and Mentzer, 1998). However, today the use of qualitative research has increased in supply chain management and the logistics field, as a result of the quantitative approach being repetitive and inefficient. Naslund (2002) argues that the logistics and supply chain discipline lacks qualitative research and the field would benefit from obtaining more rich data to improve processes, strategies and other areas in the field. The use of qualitative methods in supply chain management reveals subjectivity, complexities, nuances, uniqueness and details that are ignored in quantitative studies (Klein and Myers, 1999).

Flint (1997) suggests a need for more qualitative research in the supply chain management discipline and this is also supported by other scholars, for example, Daugherty (2011); Ellram (1996); Hill et al. (1999); Mangan et al (2004); Marasco (2008); Naslund (2002) and Stock (2002). It should be noted that qualitative analysis gives a deeper and more meaningful understanding of the theory being tested whereas quantitative analysis is frequency based and information is analysed through statistics. Moreover, the majority of articles published in many logistics and supply chain and management journals have adopted the positivist or quantitative research approaches (Kotzab, 2005).

Arlbjorn and Halldorsson (2001); Mentzer and Kahn (1995); Mentzer and Flint (1997); Garver and Mentzer (1999), argue that research in logistics and supply chain management needs to build stronger theories and that there is a need to focus on theory-testing as this will be the future path of logistics knowledge creation. These researchers support future research to differ from the quantitative methods and explore qualitative methods. Qualitative methods involve meeting, and communicating with and observing the respondent, and from there, rich descriptions and more data can be acquired. Payne (1995; p.61) states that positivist research is high in rigour but very low on connecting with the problems to the research phenomena. Naslund (2002), investigates and compares research in supply chain management, and is also supported by investigations performed by Dunn et al., (1993), that quantitative methods dominated the research conducted in supply chain management, employing surveys, structured interviews and modelling. The investigation also shows a low percentage of research has been conducted using qualitative research methods for example case studies and action research.

Naslund (2002) supports that problems and issues in the logistics and supply chain management area are often ill structured, messy and are real world problems. These issues cannot be quantified, and in order to change these situations, we would first have to understand these paradigms and their influences on how we approach and evaluate these problems, and by using qualitative methods, more solutions could be provided and identified to offer structure to these real world problems.

Silverman (1993, p. 20) argues some problems with quantitative research, with a focus on surveys, "*the critique of purely quantitative research has a long history beginning in the 1950's. The main criticism stems from the dissatisfaction with the type of research information as well as the results provided by quantitative techniques. The*

*information can be clouded due to the complexity of the methods, the large sample sizes needed and the difficulty in understanding and interpreting the results from complex quantitative studies*" (Van Maanen, 1982).

Checkland (1993), states that in organisations, in human activity systems, like that of supply chain management and logistics, systems are subject to numerous influences which means that time, culture and environment will always modify perception of the problem, and quantitative methods are not capable of capturing these influences which can bring along change and provide solutions to problems.

To conclude, research in the area of supply chain management and logistics has been mostly viewed from a quantitative research approach, with little input from the qualitative research methods, because of this, real world problems have been vaguely identified, and solutions to these problems have yet to materialise. Past research in this area encourages more qualitative research to be conducted, from a different research philosophy, interpretivism is encouraged as research will be carried out in a more detailed manner and will provide a clear explanation for every research paradigm, especially, in the case of this research project, where the issues and problems of the supplier selection decision making are identified, how suppliers are sourced in Malaysia, and their relationship to the presence of Information technology, business intelligence and artificial intelligence tools in the decision making process.

Therefore, the choice of adopting a qualitative methodology is justifiable in parallel to the researcher's philosophical stance. In recent times, more research in supply chain management, and other business related subjects are being conducted, as these studies are proven to be useful tools, and this is being encouraged to investigate issues and have a clear understanding of the existing problems.

To conduct and acquire the relevant data for this research project, the adaptation of a qualitative case study proved to be the most appropriate approach.

This research will provide valuable insight using qualitative findings in the area of supplier selection in Malaysia's steel and fabrication sector. Other research conducted in Malaysia in other business sectors and supply chain management, for instance: healthcare, operations management, furniture, has mostly used quantitative methods, for instance, the multiple regression model (Ndubisi et al., 2004); fuzzy multi-objective linear model (Tahriri et al., 2007) and data envelopment analysis (Liu and Hai, 2004).

With regards to the case study method used in this research, it is a good choice as the researcher could investigate deeper and uncover unknown information, and therefore gain a better understanding of supplier selection in Malaysian manufacturers. It is significant to note that the case study chosen in this research is based on the research gap and research problems. The case study is normally not systemically sampled and it's most significant point is to highlight that it is able to understand certain phenomena with a clear understanding.

Merriam (1992), addressed sample size, and states that the number of samples in a qualitative study is not an issue, since the number shows the potential of each person to contribute to the development of insight into accepting the phenomenon.

Therefore, a small sample is acceptable in qualitative research, because a statistical outcome is not the main objective of qualitative research.

These above points justify the small number of cases used in this research.

## 3.4 Research Strategy: Case Study

This research project has undertaken a qualitative case study approach. Eisenhardt (1989, p. 534), defines a case study as "*a research strategy which focuses on understanding the dynamics present within a single setting*". As previous research indicates, case studies can be used in both qualitative and quantitative studies (Yin, 2009).

"*A case study is an objective, in depth examination of contemporary phenomenon where the investigator has little control over events,*" (Yin 1989).

Therefore, the case study strategy was used in this research project to understand and explore supplier selection decision-making, supplier selection criteria, the presence of business intelligence and artificial intelligence tools and technologies. Furthermore, the problems and issues in Malaysian manufacturing are justified.

Case studies are often applied to articles based on interviews of key figures or managers, summarising an insider's view of particular events (McCutcheon and Meredith, 1993).

The case study typically involves one or more researchers gathering a considerable volume of data from within an organisation to develop the clearest possible picture of the phenomenon. The data may come from primary sources (such as interviews of people involved) or secondary sources (documents or records) (McCutcheon and Meredith, 1993).

Case study research is one of many empirical approaches that aims to develop our understanding of "real world" events (McCutcheon and Meredith, 1993).

Miles and Huberman (1994) state that "*building a theory from a single or multiple cases and enhances theoretical constructs by developing propositions/ theories for empirical evidence or evaluation*." It is recognised that having multiple cases could strengthen

empirical findings further. Yin (1994, p.6) states that a case study is most suitable when the research questions start with what, why and how as opposed to questions starting with who, where, how many, and how much. A case study as a research strategy is preferred when an examination of a unique event is occurring.

To address the issue regarding the number of cases in a case study, in this case, single or multiple, Eisenhardt (1989, p.534) and Yin (1994) suggest that one or many cases can be included in a case study. This all depends on the generalisations that can be drawn from the case study.

Yin (1994) and Irani et al. (2008) both state that there is nothing wrong with using one case study in case study research because "*one can often generalise on the basis of a single case".*

However, in this research, the researcher was able to provide multiple cases, in order to gain an in-depth understanding in line with the research objectives of this research. Multiple cases "*represent replication that allows for development of a rich theoretical framework*" (Ellram 1996; Stuart et al., 2002).

This research explores six (6) case studies in order to acquire rich data on supplier selection decision-making, sourcing of suppliers, the presence of business intelligence, information technology and artificial tools and technologies in Malaysia manufacturing.

In supply chain management and operations management research, there is not a strong presence of case study research. This presents a gap in supply chain and operations management research (Stuart et al., 2002; McCutcheon and Meredith, 1993).

However, it is significant to note that, in order to conduct a qualitative case study it should be guided by case study protocol (Yin, 1994; Miles and Huberman, 1994; Eisenhardt 1989).

## 3.5 Case Study Protocol

A case study protocol (CSP) is a set of guidelines that can be used to structure and govern a case research project (Yin 1994). It therefore outlines the procedures and rules governing the conduct of the researcher before, during and after a case research project (Maimbo and Pervan, 2005).

The case study protocol has been identified as a key approach to ensure uniformity, and validity in data collection and analysis (Maimbo and Pervan, 2005), increasing reliability of the case study research (Ellram, 1996), and the CSP also contains research instruments that will be used to collect data (Maimbo and Pervan, 2005).

For this purpose of this research, a well-established methodological guideline is adopted, as suggested by Eisenhardt (1989), Flynn et al., (1994), Meredith (1993), Maimbo and Pervan (2005), and Yin (2013), in order to increase validity of the research findings.

According to Einsendhart (1989), a case study protocol is divided into three phases, as can be seen in in Figure 3.1. The researcher follows three steps in conducting this research

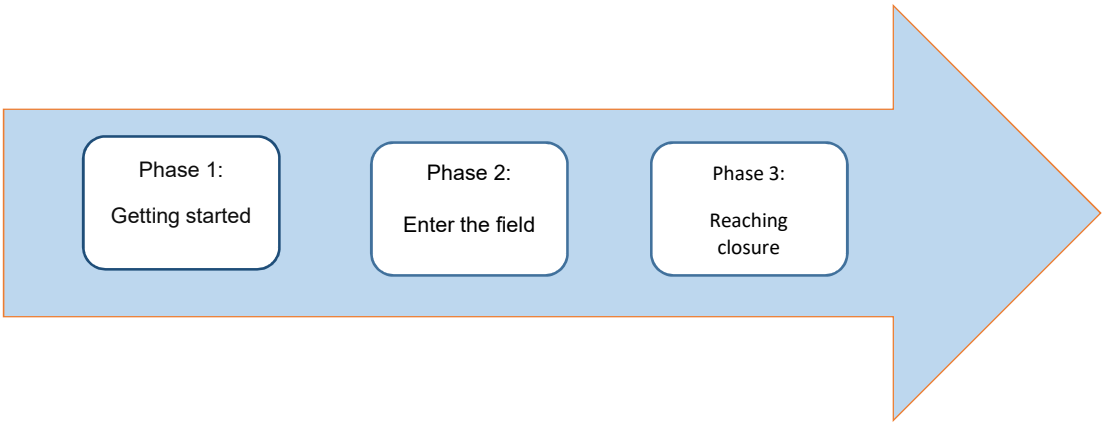



*Figure 3.1 Case Study Protocol*

## 3.6 Phase 1 – Getting started: Selection of Cases and Development of Instrument and Protocol

At the initial stages of this project, the research approach was going to undertake a mix between qualitative and quantitative research methods. To initiate this process, a pilot study was conducted. Teijlingen and Hundley (2002), refers to pilot studies in two ways, one of which can be feasibility study or trial run in preparation for the major study and a pilot study can be used as pre-testing or trying out of a particular instrument. One of the advantages of conducting a pilot study is that it might give advanced warning about where the main research project could fail, where research protocols may not be followed, or whether proposed methods or instruments are inappropriate or too complicated (Teijlingen and Hundley, 2002).

Moreover, Kim (2010) refers to the implementation of a pilot study or exercise that has proven successful in the following ways: -

- Finding issues and barriers relating to recruiting of potential participants.
- Engaging the use of oneself as a researcher in a culturally appropriate way from a phenomenological perspective.

- Reflecting the importance of the epoch and its difficulty in conducting the inquiry.
- Modifying the interview questions.

Given these above listed advantages a pilot exercise was undertaken. In the case of this research, Malaysia is viewed as a “fast industrialising country”, yet Malaysian manufacturing is an under-researched area. For this reason, a pilot exercise proved to be the best approach to start assessing the validity of the research questions, to ensure that the appropriate questions were being asked to achieve the objectives of the research project, and to assess if the mixed methods approach would have been the most suitable approach for this project.

Through existing contacts in Malaysia, operating in manufacturing industry, four (4) participants were identified. Although, there is an on-going debate regarding sample size, Johanson and Brooks (2009), state that social science literature does not place emphasis on the quantity rather the quality and the richness of the information acquired, that facilitates the purpose of embarking on the pilot exercise.

After undergoing the pilot exercise, the research questions were redefined, and an online large-scale survey was prepared, and distributed through Survey Monkey. The purpose of conducting this survey, would have allowed for quantitative analysis elements of this study to be conducted.

Many researchers in a variety of disciplines utilises the Internet as a fruitful way of conducting research, as the cost of online survey distribution software decreases and the popularity of the Internet increases for communication and information (Wright, 2006).

Another advantage of online survey research is that it allows access from unique populations. The Internet provides access to groups and individuals who would be difficult or rather impossible to reach through other channels (Bradley 1999).

Another important advantage of conducting an online survey is time. Wright (2006) states that Internet based surveys may save time for researchers. It is already noted that online surveys allow the researcher to reach participants in great geographic distances, and online surveys also support the researcher in saving time, by allowing the researcher to collect data whilst they work on other tasks.

To identify participants for the online survey, the Federation of Malaysian Manufacturing was identified as the most reliable and accurate source of a list of manufacturers operating in Malaysia. The purposive sampling technique was used to identify suitable companies to participate in the exercise. Companies with employees of over 200 were selected and distributed. The selection of the companies was a result of findings through the pilot study; companies below 200 employees were less likely to be using Information Technology, Business Intelligence and Artificial Intelligence tools, due to the cost of investment, management, and sophistication of the software.

Although there are many strong advantages of conducting online surveys, there are various plausible disadvantages.

In the case of this research, the Federation of Malaysian Manufacturers, a directory issued and distributed by the Malaysian government, was identified by Malaysian businesses as the best source of existing and operating manufacturers in Malaysia. However, the study suffered with a low response rate, which resulted in a change of the initial mixed methods direction.

Fricker and Schonlau 2002; Ilieva *et al.*, 2002; Sheehan and McMillan, 1999; Wilson and Laskey, 2003) state a popular conclusion that " *there is limited evidence in the literature that online surveys generally obtain higher response rates than do other survey types. They report that the majority of reported results show online surveys to at best attain response rates equal to other modes and sometimes to do worse; and they suggest that the reasons for this merit more study."*

Additionally, other researchers have identified the following issues similar to the issues experienced in this study:

### 3.6.1 Sampling Issues

Wright (2006), discusses sampling issues, and states that in the cases of geographic distances, little may be known about the characteristics of people, aside from demographic variables. Wright (2006) also states that, although, email lists are available and is provided by certain populations, there is no guarantee that participants will participate in online surveys. Stanton (1998) argues that in online-based research, there are individuals who are more likely to complete an online survey than others, whilst others ignore it.

### 3.6.2 Implications of Using Web Survey Products and Services

Wright (2006), suggests that although using web based products, for example Survey Monkey as utilised in this research project as having many advantages, such as: saving time, utilising template services offered by the package and an ease of email distribution. Using these tools can also affect the quality of data in many ways. Wright (2006) argues that using these tools does not circumvent issues; in fact, it affects response rates, participant deception, and access to population.

### 3.6.3 Perception as Junk Mail

Whilst distributing surveys through Survey Monkey, many emails were either blocked from sending or were returned, or “failure to send” error messages were received, or, the emails were rejected, as there is a firewall preventing emails from Survey Monkey from being sent.

Evans and Mathur (2005) identify an issue regarding online survey distribution as “perception as junk mail”. Evans and Mathur (2005) states that even if an email comes through from a “trusted source”, it is unlikely that the survey link will be clicked as this takes the participant to another webpage. Bannan (2003) states that most emails received of this nature are usually blocked by company firewalls.

### 3.6.4 Respondent Lack of Online Experience and Expertise

Whilst conducting the pilot exercise, one of the drawbacks of implementing information technology tools was a lack of experience, expertise, familiarity and lack of willingness to learn new ways of working. In some cases, after the survey was distributed, the participant responded to the researcher stating, “they did not understand how to use Survey Monkey”, and presented an unwillingness to complete the survey.

Evans and Mathur (2005) highlight, that although the Internet population is being more representative, there may be still survey difficulty due to the lack of familiarity of possible respondents to Internet protocols.

### 3.6.5 Impersonal

Another finding of the pilot study, is that most Malaysian manufacturers conduct their business in a “who do we know” manner. Mostly interacting with companies and people to whom they have interacted with over the years and have formed

relationships with. Most respond to and prefer to give information to people and prefer human interaction. Evans and Mathur (2006) identify the “impersonal” element of online surveys as a disadvantage, as there is a lack of human interaction. This can limit the probe to acquiring in-depth information gathering and in some cases, the completion of surveys will be avoided, as they are unsure of the person or entity their information is going to and it’s usage.

In light of the issues faced the methodology plan was revised, and restructured to facilitate data collection and the execution of this research project.

At this phase, the selection of cases and development of instruments and protocols are established. This also includes sampling and the development of the interview questions. Sampling techniques provide diverse methods that permit the researcher to reduce the data collected by analysing the data from a sub group only, rather than all elements (Saunders et al. 2009).

In this research, the cases are selected based on a purposive approach and snowballing technique.

Devers and Frankel (2000), explains that the purposive sampling approach is most commonly used in qualitative research, as it is designed to enhance understandings of selected individuals or groups experience for developing theories or concepts. In other words, purposive sampling enables the researcher to select cases that will be most suited to answer the research aims and objectives. This type of sampling is most commonly used when the sample size is small, as in the case study research (Neuman, 2005; Saunders et al., 2009).

The participants for this study were selected by approaching SMEs who responded to the online survey selected from the directory of the Federation of Malaysian

manufacturers, a Malaysian government official directory of Malaysian manufacturers. The researcher utilised this directory to validate the companies being approached, also the contact details for procurement managers or persons involved with supplier selection were included. The researcher followed the direction shown from the literature review that the most suitable persons to be interviewed for data collection would be procurement managers.The most suitable person at each company was then emailed and their permission sought to participate in an in-depth interview. From this process, four companies responded positively to the request from the interviews after explanation of the topics to be discussed was provided.

To increase the number of respondents to the interviewing process and to best utilise the time and resources spent in data collection spent in data collection in Malaysia, a snowballing technique was employed for this research. Participants of this research study contacted other procurement managers in the SME manufacturing industry, and sought their interest to participate in the study. The snowballing technique can be defined as a technique used for finding research subjects (Atkinson and Flint 2001). One of the main advantages of this technique is that it seeks to take advantage of social networks, to identify respondents to provide the researcher with an ever-expanding set of potential contacts (Thomson, 1997).

The snowballing technique is most commonly used in qualitative social science research. The method is well suited for a number of research purposes and it is particularly applicable when the study is on a sensitive issue, possibly concerning a private matter (Biernacki and Waldorf, 1981). Snowball sampling can be applied for two primary purposes. Firstly, and most easily, as an ‘informal’ method to reach a target population. If the aim of a study is primarily explorative, qualitative and descriptive, then snowball sampling offers practical advantages. Snowball sampling is

used most frequently to conduct qualitative research, primarily through interviews. Secondly, snowball sampling may be applied as a more formal methodology for making inferences about a population of individuals who have been difficult to enumerate through the use of descending methods such as household surveys (Atkinson and Flint, 2001).

In the case of this research, this method was most suitable for the researcher, as supplier selection is a private and sensitive issue for Malaysian manufacturers, suppliers listed in the supplier approved list is viewed as a competitive tool against competing suppliers and other companies in the same industry. Most suppliers, when approached through email correspondence, were not comfortable to discuss their supplier selection activity with the researcher. However, the researcher was able to overcome this by using the snowballing technique to access other Malaysian manufactures, as the referrals were based on trust from the referee.

The manufacturing industry in Malaysia is selected in this research, as there is a dearth from past research in examining the supplier selection decision-making, and the presence and usage of information technology, business intelligence tools, and artificial intelligence tools. Moreover, most research in this field focused on more quantitative methods, and provided frameworks to quantify supplier selection criteria. In the case of any sector in manufacturing, supplier selection remains the foundation of this process.

For this research, six Malaysian manufacturing SMEs took part in this study. This was considered a sufficient number to illustrate the sector. As previously stated, there is no ideal number of cases but the six participating cases do provide a good indication of the supplier selection decision making process and the presence and usage of

information technology tools and technologies, business intelligence tools and artificial intelligence tools used in the Malaysian SME manufacturing.

It should be emphasised that this research adopts a multiple case study approach as the researcher recognises that the external validity of this research will be increased because of comparative results that could be analysed through 'within case' analysis and 'cross-case' analysis, thereby using replication logic (Miles and Huberman, 1994; Yin, 2003). The units of analysis in this research are as follows: how suppliers are sourced, the supplier selection decision-making process, the presence of business intelligence tools and technologies and the presence of artificial intelligence tools and technologies. In this research, the researcher analyses six (6) cases which represent the relationships between how suppliers are sourced, the supplier selection decision-making process, the presence of business intelligence tools and technologies, and the presence of artificial intelligence tools and technologies. However, it should be emphasised, that the purpose of the propositions developed in this research are not to test but to guide the researcher to collect the data beyond the area of research in order to gain a deeper understanding into the research context and to answer the research questions (Yin, 2013). Within the development of the propositions and conceptual model developed from the literature, it is recognised to help the researcher in the analysis process especially at the stage of the coding process (Miles and Huberman, 1994).

At the first phase of the case study protocol, the interview questions are developed. The development of the interview questions is based on the review of the literature, which developed a conceptual model (Chapter 3). The questions were developed based on the review of the main literature. As the investigation is based on four components; supplier selection decision making process, the information technology

presence, the business intelligence presence and the artificial intelligence presence; the interview questions were developed and known as the “Open Interview Guide”.

The open interview guide is vital as it helps the researcher to develop relevant lines of questioning that are easily understood within the context of the study (Yin, 2009), based on key themes and questions developed by the researcher.

As a result of discussions and previous knowledge from the pilot study, the interview questions remained at 18 questions. This is significant to suite the interview length of approximately 60 minutes. In most cases, when the researcher conducted the interviews with the interviews proceeded over two hours, but this was the decision of the interviewee as their answers to the researcher’s questions were in depth.

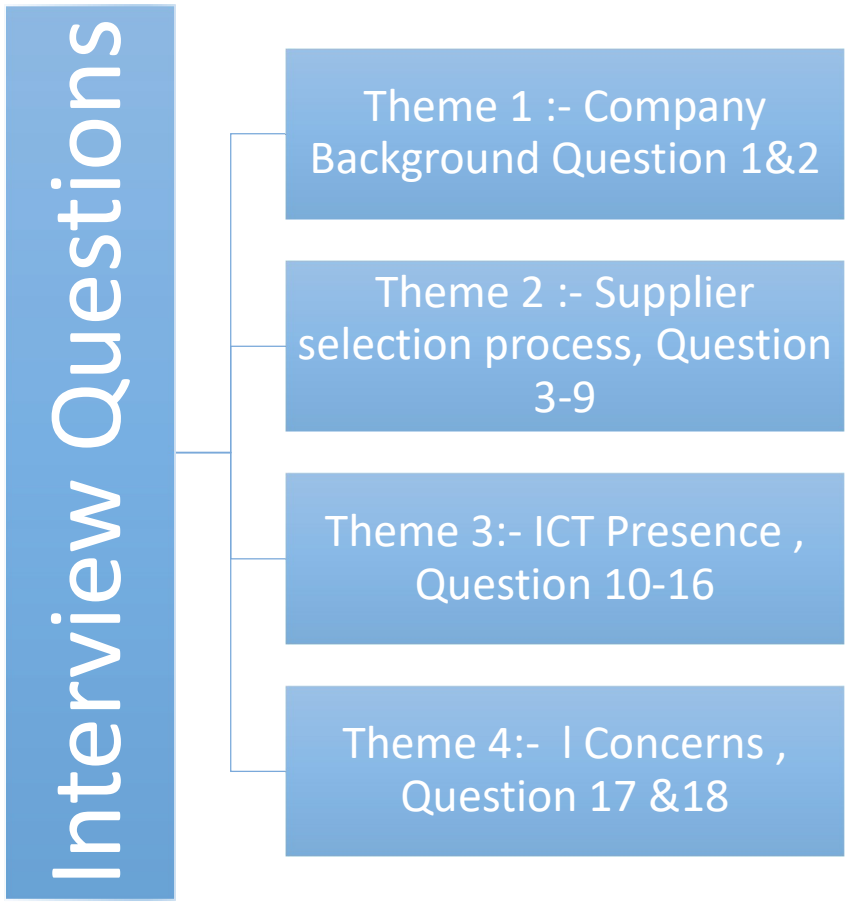



*Figure 3.2 Main Theme Explored and its sequence in the Main Interview Questions used for Empirical Study*

Figure (4.2) represents the different themes discussed in the interview questions. Theme 1, discusses the company background, where the respondent is being asked about the company and the different countries that the company does business with. The responses to these questions provide the researcher with information about the scope, type of products, employee size, departments and divisions of the company. This question will also indicate to the researcher, the countries where there are supplier relationships.

Theme 2, discusses the supplier selection process of the company, including how suppliers are located, supplier evaluation, the supplier selection decision-making process, and issues and problems arising within the supplier selection process.

Theme 3, discusses the Information Communications and Technology presence within the company, including, the Business Intelligence and Artificial Intelligence tools and technologies present within the company. This includes, identifying how the above mentioned tools support the supplier selection process, the tools that are used to support the selection process and how the supplier selection data is stored.

Theme 4, discusses managerial concerns regarding the supplier selection process. These questions prompt the respondent to give their views on issues, problems, obstacles and suggestions on Information Technology tools, Business Intelligence tools and Supplier Selection tools, and in most interviews, allowed the respondent to speak about the Malaysian cultural influence on their supply chain and the ways in which it affects their business.

### 3.6.1 Phase 2: Data Collection and Data Analysis

Phase 2 refers to entering the field, analysing the data and shaping the propositions.

The data collection exercise consisted of conducting interviews with six (6) Malaysian manufacturing organisations along with document reviews. These organisations represent six case studies and in order to keep the names of the companies confidential, the cases in this research are known as case study A, B, C, D, E, and F. These case studies investigate supplier selection, business intelligence and artificial intelligence and other managerial issues in Malaysian manufacturing companies.

In performing semi structured interviews, it is widely recognised that the interviewer should have a framework of themes to be explored (Miles and Huberman, 1994), which are developed at the first phase of the case study protocol as discussed in Phase 1.

A case study protocol is beneficial for interviewers to have an interview guide prepared, which is an informal "*grouping of topics and questions that the interviewer can as in different ways for different participants"* (Miles and Huberman, 1994). This justifies the use of propositions in this research as a means of allowing the researcher to collect data beyond the research area.

Earlier in this chapter, an interview guide was discussed as an essential part of the interview process, and this guide aids the researcher to maintain focus on the interview topics without needing to keep a specific format. This freedom, benefits the interviewer to modify their questions to the interview, context, or situation and to the people they are interviewing (Lindlof and Taylor, 2002). The rationale of adopting a semi-structured approach in this research is due to the contributing areas of research to this research

project, as previously discussed, the Malaysian manufacturing in regards to supplier selection, and its relationship to information technology, business intelligence and artificial intelligence tools and technologies are still under research. By utilising the advantages of semi-structured interviews, the researcher is able to obtain rich information and insights into the phenomenon and also allows for new questions to be brought up in the interview as a result of what is being said by the interviewer. In addition to questions, new factors that affect supplier selection are also brought to light. It should be noted, that the interview questions asked during the interview sessions, sometimes did not follow the sequence as reflected in the interview guide. The questions were asked based on the flow of conversation, and dependent upon the interviewee's answers to previous questions (Saunders et al., 2009). During the interview, some documents were shown to the interviewee as part of their explanations. In regards to the area of research, one of the main and common areas of operating in the manufacturing sector would be company's adhering national procedures and protocols.

In addition, the researcher was allowed by the interviewer to view how existing suppliers are selected for a purchase, in order to view how information technology tools were used to support supplier selection processes. Also, the interviewee allowed the researcher copies of past-completed transactions. Such action, allows for the collaboration of data, and allows the researcher to confirm what the interviewee has said. The past transactions given to the researcher is used at the analysis process. The documents reinforced the conceptual model drawn up by the researcher in Chapter Three.

In this research, the majority of the interviews were completed in English, and in one case, a translator was present, as the interviewee could not speak English. The people involved in the business sector in Malaysia are recognised to be proficient in the English language. All of the interviewee participants agreed to be recorded.

Although, English is widely used in Malaysia, mostly in the business sector, the researcher recognises that this is not the first language of the country. According to Barriball and While (1993), the use of semi a structured interview gives the interviewers the choice of wording each question to meet the needs of the interviewee and the use of probes. Probing is viewed as an interview technique that ensures the reliability of the data, as it allows for the clarification of interesting and relevant issues raised by the respondents, provides the opportunities to explore sensitive issues and allows the interviewee to explore and clarify inconsistencies with the respondents (Barriball and While, 1993).

Each interview took approximately 60 minutes, and was conducted on a one to one basis. Before each interview, the researcher (the interviewee) via email and telephone ensured that the interviewees were all informed, providing a list of topics that would be discussed.

Along with data collection, this phase of the case study protocol involves data analysis. The first step after interviewing involves data interview transcription.

The second step of data analysis undertaken in this project is the organising and analysis of the interview transcripts and to enable this process; the NVIVO 10 software was used, "*NVIVO presents many advantages and may significantly improve the quality of the research*" (Hilal and Alabri, 2013).

The core of qualitative data analysis includes the process of bringing order, structure and meaning to the mass of data collected and creating relationships and linkages within the data (Hilal and Alabri, 2013). Moreover, the use of a computer software tool helps to ensure rigour in the analysis process (Bazeley 2002), whereas, data analysis conducted without the assistance of a computer tool is more likely to have issues with data accuracy and consistency.

For this project NVIVO is advantageous and most suitable as it is able to organise, store and manipulate nodes.

### 3.6.2 Phase 3- Reaching Closure

Phase three of the case study protocol compares relevant literature and the responses from the interviewees. In this research, theoretical saturation is considered to have been considered to have been achieved when the researcher finds the interviewees cease to provide any new information cease to provide any new information regarding a particular theme (Miles and Huberman, 1994).

Einsenhardt and Graebner (2007), argue that theory building can be achieved from case studies when replication logic is achieved.

The researcher reached theoretical saturation when the following occurred:

- Credibility was established was established, ensuring that that there are strong links between the data gathered and the phenomenon being explored.
- The data gathered was sufficient to achieve new contributions to knowledge.
- The themes of the research offered new insights to the phenomenon.
- No more themes can be identified when coding the data

The process of the coding can be viewed on page 448-453, Appendix A.

## 3.7 Research Design

It could be concluded that the research design of this project takes into consideration the subject of rigour, and trustworthiness, with these factors being significant to both qualitative and quantitative studies. The below diagram represents the research design undertaken for this research project.

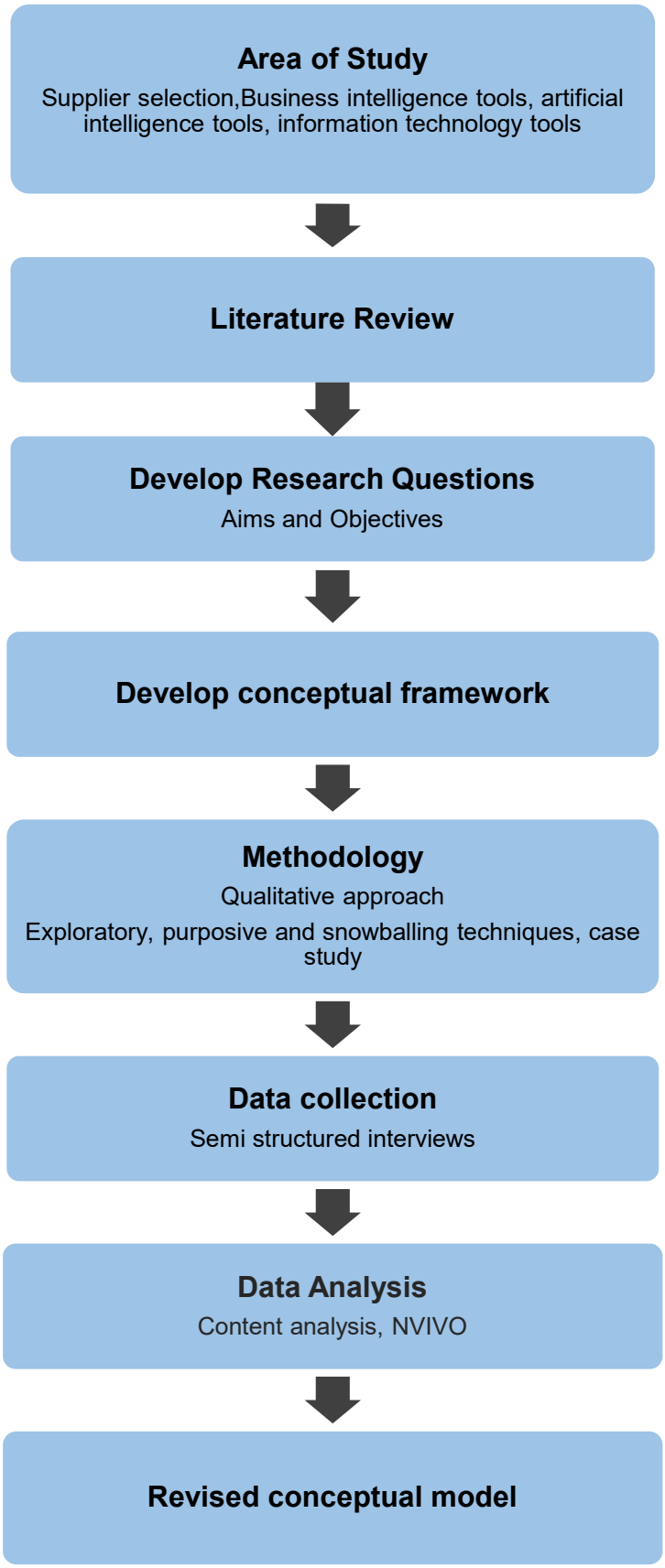



Figure 4.3 Research Design of the Research Project

### 3.7.1 Validity and Reliability

An Interpretivist will usually look at the human experience that cannot be understood through reductionist measures (Angen, 2000).

Moreover, to support the evaluation of the quality of research, conventional criteria must be adhered to. Qualitative research is mostly seen from either an interpretivist or a positivist paradigm, and in each paradigm, there are different criteria used to evaluate the research.

"*Interpretive researchers assume that reality as we can know it is construed intersubjectively through the meanings and understandings garnered from our social world*"(Angen, 2000).

In information systems qualitative research, the research paradigm mostly leans towards the positivist or the interpretivist paradigms. Some research would agree that supply chain management and information systems research can be classified as positivist if there is evidence of a formal proposition, quantifiable measures of variables, hypothesis testing, and the drawing of inferences about a phenomenon from a representing sample (Klein and Myers, 1999), and to conduct and undergo positivism, evaluation criteria needs to be adhered to. However, in the case of this research, whilst criteria is useful in evaluating, conducted according to the natural science model of social science, the positivist criteria suggested are inappropriate for interpretative research.

As with positivism, interpretivism also adheres to criteria taken into consideration to ensure validity and reliability in interpretive research, namely, credibility, transferability, dependability, and confirm ability (Lincoln and Guba, 1985).

Credibility refers to “an adequate representation of the constructs of the social world in the study” (Bashir et al., 2008). Credibility ensures the accuracy of the research project, and in the case of this research project to ensure this triangulation with (current literature, earlier conducted pilot studies), and member checking being conducted. These processes are recognised in the eight primary strategies to ensure validity (Creswell, 2014).

To support the validity of this research, data analysis triangulation is used to ensure validity. For this study, triangulation occurs between the interpretation of the pilot studies, semi structured case study interviews and document review.

Patton (2005), states that the use of triangulation strengthens a study by combining methods, this can mean using several kinds of data. Undertaking data triangulation not only strengthens the validity of the data, but also allows the researcher to concentrate on the interpretive phenomenon undertaken for this study (Maggs-Rapport, 2000).

The researcher used triangulation to explore the different sets of data, interpret the situation and define emerging themes.

The second criteria to be addressed is transferability, explained as the extent to which the findings are transferable and can uphold a general claim about the world (Creswell, 2014).

In discussions involving transferability, the topic of external validity is addressed, as in how could this research be applied to another context. To adhere to these criteria, this research provides a “rich, thick description to convey the findings. As a qualitative research project, readers and researchers will be offered a different and needed perspective into the supplier selection

decision-making process in the Malaysian manufacturing industry. Also, the research can be modified, and adapted to other fields of industry.

The third criteria is dependability, and this "occurs when another researcher can follow the decision trail used by the researcher. An audit trail is achieved by (a) describing the specific purpose of the study; (b) discussing how and why the participants were selected for the study; (c) describing how the data were collected and how long the data collection lasted; (d) explaining how the data were reduced or transformed for analysis; (e) discussing the interpretation and presentation of the research findings; and (f) communicating the specific techniques used to determine the credibility of the data" (Thomas and Magilvy, 2011). These criteria could be determined by checking the consistency of the research process as described earlier in this chapter.

The last criteria is known as confirm ability, and this is defined as "the extent to which the characteristics of the data as posed by the researcher, can be confirmed by others who reads or review the research results" (Thomas and Magilvy, 2011). For this research, these criteria can be confirmed as procedures that were implemented including, interview protocols, participant information sheets, following methodological procedures to carry out this research.

The following table 3.2 gives details how the researcher applies the four main criteria to the research.

| Trustworthiness Criteria used in this research (Lincoln and Guba, 1985) | Description of Trustworthiness | Method/Procedure/Process applied in this research |
|---|---|---|
| **Credibility** | Ensure the accuracy of the research. | • **Continuous involvement** -the data collected began with a pilot study in May 2013, continuing with methods of data collection throughout the end of the research project. Various methods of data collection were conducted to understand the phenomenon (pilot studies, surveys, semi structured interviews)<br>• **Method triangulation** – during the course of the research; pilot studies, semi structured interviews, surveys, document review.<br>• **Theory triangulation** – The research observes the phenomenon of three different perspectives; the supplier selection decision-making process in Malaysian manufacturing; the presence of business information technology tools; the presence of artificial intelligence tools and technologies.<br>• **Data triangulation**- using multiple case studies in this research project. |

| | | |
|---|---|---|
| **Transferability** | If the study's findings are generalizable beyond the immediate study (Yin, 1994, p.33) | • **Replication logic –** This method was used in the analysis phase of the research. (Yin, 1994, p.33) |
| **Dependability** | Demonstration that the operations of the study (such as the data collection procedures can be repeated, with the same results) (Yin, 1994, p.33) | • The research follows the outline of the case study protocol.<br>• Interviews are recorded with the permission of the interviewees, to ensure data accuracy for the analysis of the data. |
| **Confirmability** | Internal validity; establishing a causal relationship, where by certain conditions are shown to lead to others | • Establishing research questions from the current research and maintaining the evidence (Yin, 1994).<br>• **Clarifying the bias**- the researcher brings to the study, avoiding bias, and allowing the data naturally flow from the interviewee (Creswell, 2014) |

Table 3.2 gives details on how the researcher applies the four main criteria to the research.

## 3.8 Data Analysis

### 3.8.1 Transcribing the Qualitative Data

This section illustrates how the researcher transcribed the interview scripts post interview and can be seen in Appendix B of the thesis. In this research project, the researcher transcribed the interview conversation from the recording. Consent was given from the interviewee, and subsequently transcribed, producing a word-processed document (verbatim). The benefits of the

existence of verbatim transcripts are that it facilitates the development of an audit trail of the data analysis by independent persons (Halcomb and Davidson, 2006). Another beneficial factor of an existing verbatim transcript is the support of the reliability of the research project (Halcomb and Davidson, 2006). However, as this process is prone to errors, this transcript can be double checked to pinpoint and correct these errors, with the support of the video recording.

The transcribing process in this research was completed immediately after the interviews were completed. After, each interview the researcher summarised the main talking points of the interviews. As mentioned above, interview transcription is prone to errors, to ensure data accuracy; the researcher repeated the process to ensure the transcripts matched the audio recording.

The transcription was recorded using Microsoft Word, and the scripts were based on the real interview and not the true sequence of the questions. As previously mentioned, interview questions did not always follow the sequence on the open interview guide, in some cases questions were asked to carry on the discussion between the interviewee and the interviewer.

However, the researcher changed the order in the transcripts for data analysis process and for standardisation as shown in the Appendix B.

The summary created at the end of each interview, proved to be an important tool to the researcher, as it helped to gain an insight of the developing themes to be explored.

### 3.8.2 Qualitative Data Analysis (QDA)

This section explains the reasons for choosing NVIVO 10 as the program used to organise, manage the data to generate themes.

Following on from the previous section, after transcription, the interview scripts are transferred to NVIVO 10. This software helps the researcher to systematically manage and organise themes which assists with the thematic coding phase later on.

It is recommended that each case study should follow a course of evaluating data gathered in the previous stages of the study. "*Data analysis consists of examining, categorizing, tabulating or otherwise recombining the evidence to address the initial propositions of a study*" (Yin, 1994). In addition, Yin (1994), suggests that every investigation should have a general analysis strategy, so as to guide the decision regarding what will be analysed and for what reason. Yin (1994), proposes some analytical techniques: *pattern-matching, explanation-building and time-series analysis.* Moreover, Miles and Huberman (1994), support the analysis strategy posed by Yin (2004), in noting that all qualitative data analysis, including case studies, should follow a general analytic strategy which defines priorities for what information should be analysed and why.

Considering the above, the data analysis strategy starts with using a "within case and cross case analysis". The adoption of this strategy was sought as the most appropriate to fulfil the aims and objectives of this research. This research project is based on what is currently known about the supplier selection process

in Malaysian manufacturers and it offers the opportunity to identify what is unknown to fulfil the gaps in this research area. This research explores the supplier selection decision making process of Malaysian SME manufacturers. The use of thematic analysis and coding highlights the interpretivist nature of the research methodology, which offers the researcher the opportunity of identifying what is unknown, thereby, understanding any gaps in this research area.

Morris (1994), highlights the technique as being useful to management research as valid inferences from textual communications can be drawn. "*Content analysis provides the researcher with opportunities to unobtrusively study the values, sentiments, intentions and ideologies of managers generally inaccessible to researchers*" (Morris 1994). As such, content analysis proves to be advantageous to strategic management, supply chain management and management research.

Qualitative data analysis methods differ from quantitative methods, as much richer data is analysed compared to numeric data, to provide understanding.

Miles and Huberman (1994), suggest that qualitative data analysis consists of three procedures: *Data reduction, data display and conclusion drawing/verification*. These three stages, are the most suitable for this research project as the researcher undertakes an interpretivist approach.

Bryman and Bell (2007) suggest three different types of qualitative data analysis, such as, repertory grid technique, narrative and thematic analysis. For each method, their strengths pose advantages for different fields of research. In the case of narrative research, this method is most suited for reporting on

the respondent's perspective or experiences. Repertory grid, is most suited when one wants to gain a clear meaning of the constructs and helps the respondent share their views on complex topics (Bytheway and Whyte, 2015). Thematic analysis or content analysis, is mostly used when analysis interviews and the text interpretation allows the researcher to gain a deep understanding of a complex phenomenon.

Considering the above, this research adopts the thematic analysis technique in analysing the use and presence of information technology, business intelligence and artificial intelligence tools and their relationship to supplier selection decision-making in Malaysian manufacturing. This technique will assist the researcher to explore, and identify the presence usage of information technology tools that support the supplier selection process, the current problems/issues that managers face with supplier selection, information technology, business intelligence and artificial intelligence tools, the supplier selection process, the supplier criteria that are being used and how they compare to each case by the use of text interpretation. The details of the process used by the researcher to perform qualitative content analysis will be discussed in the following section.

### 3.8.3 Qualitative Content Analysis

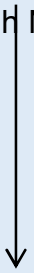
This section explains how thematic analysis was conducted for this research. Qualitative content analysis, also known as thematic analysis, is defined as a search for themes that emerge as being important to the description of the phenomenon. "The process involves the identification of themes through carefully reading and re-reading of the data. It is a form of pattern recognition

within the data, where emerging themes become the categories for the analysis" (Fereday and Muir- Cochrane, 2015).

The process uses inductive reasoning, whereby the themes and categories emerge from the data through the analysis and comparison of the data. This approach complemented the research questions by allowing the tenet of the phenomenon to be integral to the process of the development of themes. Whilst this process is important, deductive reasoning should not be excluded from the process and is also useful in this process. Hsieh and Shannon (2005), identify three approaches to qualitative content analysis, namely, conventional content analysis, direct content analysis, and summative content analysis. The trio of approaches are all based on inductive reasoning.

Selecting from the three approaches, direct content analysis is used for this research.

Within the context of the interpretivist nature of this research, a six-step approach advocated by Braun and Clarke (2014) is followed to analyse the data. Braun and Clarke (2006), describe thematic analysis as a "method for identifying, analysing and reporting patterns (themes) within data".

| Phase | Description of process within NVIVO | Strategic Objective | Process throughout Analysis |
|---|---|---|---|
| **1. Familiarise yourself with the data** | Transcription of data, read and re-reading the data, noting down initial ideas | **Data Management** Open and hierarchical coding through NVIVO  | Assigning data to refine concepts to portray meaning  |
| **2. Generate initial codes** | Coding relevant features of the data systematically across each data set, collating data relevant to each code | | Refining code concepts |
| **3. Searching for themes** | Collating codes into potential themes, gathering all data relevant to each potential theme | **Descriptive Accounts** Reordering, "coding on" and annotating through NVIVO   | Assigning data to themes/ concepts to portray meaning  |
| **4. Reviewing themes** | Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic map of the analysis | | |
| **5.Defining and Naming Themes** | On-going analysis to refine the specifics of each theme, and the overall narrative of the analysis, | **Explanatory accounts** | Assign meaning  |

| | | | |
|---|---|---|---|
| | generating clear definitions and names for each theme. | Exploring deeper meanings, drafting summary statements, and analytical memos through NVIVO | Generating themes and concepts |
| **6. Producing the report** | The final opportunity for analysis. Selected extracts relating the analysis to the research question and literature, producing a report of the analysis | | |

*Table 3.3 – The analytical process used in this research (based on Braun and Clarke, 2006)*

As per Table 3.3, the analysis was undertaken in the following stages:

1. Familiarise yourself with the data: Whilst transcribing the interview scripts, the researcher becomes familiar with the data. This is viewed as a key phase of the data analysis within an interpretative qualitative methodology and is recognised as an interpretive act (Bird, 2005: 227)

2. Generate initial codes: For this phase, the researcher having become familiar with the data, then generates an initial list of ideas about the data and what is interesting about them. This process of coding is part of the analysis (Miles and Huberman, 1994)

   **Appendix A page 448** – Phase 2 Creating initial codes (Open codes), illustrates this step.

3. Searching for themes: By this stage, the researcher has coded and collated all of the data, creating a long list of different codes that is identified across the data set. At this phase, the interpretivist nature of the research project then focuses on the broader level of themes, rather than the codes. Relationships between the existing codes, themes and different levels of themes are established.

   This is shown i**n Appendix A, page 450**, Phase 3 – Searching for themes (Developing Categories).

4. Reviewing themes: This phase involved reviewing and refining the themes of the data, also identifying how the themes fit within the research and begins to tell a story about the data. This is shown in **Appendix A, page 452**, Phase 4- Reviewing themes (Drilling Down)

5. Defining and naming themes: In this phase themes are defined and re-defined and then presented for analysis. For each theme of this phase, a detailed analysis is presented in Chapter 5, Cross Case Analysis. This chapter presents the themes and sub themes in relation to the research questions of this project. **Appendix A, page 453**, Phase 5- Developing a Thematic Framework (Data reduction) demonstrates this process.

6. Producing the report: This phase involves the final analysis and the write up of Chapter 6 of the thesis. It establishes the validity of the analysis, and presents the data in an interpretivist manner, by demonstrating that the data has been thoroughly explored, thereby gaining a deeper

understanding of the relationship between the supplier selection decision making process in Malaysian SME manufacturing and the presence and usage of information technology, business intelligence and artificial intelligence tools and technologies

### 3.8.4 Tools in Analysing Qualitative Data

Qualitative content analysis can be performed either manually, or with the support and usage of computer software. There are many advantages in using computer software, including, helping to automate and thus speed up and liven the coding process, providing a more complex way of looking at relationships in the data, and most importantly it increases rigour in a research project (Barry, 1998). Although, many research projects have acknowledged the use of computer software, many researchers still mainly conduct thematic analysis manually. For the case of this research project, the researcher decided upon using computer software due to its many advantages. Information technology is seen as a strategic tool, which supports the organisation of data, and the analysis can be performed systematically. NVIVO 10 software was used in order to deal with the complexity of the data as it functions as a strategic tool, where interview data can be stored in one place, including the storage of other supporting data such as documents for the purpose of document review, for the case of this research project. This feature allows the coding process to be conducted in a more streamlined and efficient manner. For example, the researcher was able to obtain supplier selection decision-making documents and screen shots from the different business intelligence tools used by each respondent, whilst interviewing. These documents act as key supporting data

sets to the research; moreover, these documents were also analysed, and contributed to the findings in each case. In addition, it increases rigour to the research project.

## 3.9 Ethical Consideration

In previous sections of this chapter, the methods, approaches, techniques and strategies used to undertake this research project were discussed. In this section, another element that should always be considered when conducting research will be explained. Ethical issues and ethical considerations are all-important points that must not be overlooked. The ethical guidelines set by the University of Westminster were all followed in this research, including, approval of the research project from year one, the preparation of the participant information sheet, participation consent form, and the company confidentiality agreement form. As previously noted, the names of the interviewed companies are kept anonymous, during the analysis phase using NVIVO 10 the researcher re-named the interviewee as participant A and so forth, and this process follows through in the case write-up. The Faculty Research Ethics Committee of Westminster Business School approved this research project, and the approved document can be found in the Appendix section.

## 3.10 Conclusion

This section concludes the methodology chapter for this research project; reporting the methods, techniques, strategies and approaches used to answer the research questions and validate the proposed conceptual model.

Qualitative research using the case study approach is adopted to understand the supplier selection decision making process in Malaysian manufacturing companies, and the processes' relationship to the presence and usage of business information and artificial intelligence tools used to support the decision-making process. Semi structured interviews, and document reviews to explore along with a gained wealth of information about the Malaysian manufacturing industry, and computer software NVIVO 10 assisted the researcher to interpret and analyse the data in a more systematic manner.

# Chapter 4: Case Study Analysis (Multiple Cases)

## 4.0 Introduction

The aim of this chapter is to present the six cases involved in this research by the following themes:

- Supplier Selection
- Information Technology
- Business Intelligence
- Artificial intelligence
- *The Malaysian cultural influence (The emerging theme)*

An evidence map diagram to support the findings from each sub theme of the above-mentioned themes will support each section.

## 4.1 Basic Information about the Multiple Case Studies

The respondents/interviewees are all employed with procurement, managerial or director roles, and have chosen to answer the interview questions.

The below table gives an overview of the six cases involved in the study. For the purpose of anonymity, the cases will be called Case A, B and so forth. The table lists the company name, the type of operations, the interviewer's occupation or position held at the company and the date of the interview.

The discussion of each case is presented in association with the proposition developed for that case in the order to show the relationship.

| Case | Type of Business | Sourcing policies | Occupation | Date of Interview |
|---|---|---|---|---|
| **A** | Raw Steel supplier | Internationally and Locally | Senior General Manager-Sales and Procurement | Tuesday 2nd June, 2015<br><br>Face to face interview |
| **B** | Steel fabrication | Internationally and Locally | General Manager and Procurement executive | Monday 8th June 2015.<br><br>Face to face |
| **C** | Steel fabrication | Internationally and Locally | Senior Procurement Manager | 10th June 2015<br><br>to face |
| **D** | Steel fabrication | Internationally and Locally | Director | 23rd June, 2015<br><br>Face to face |
| **E** | Technology company | Internationally and Locally | Senior Procurement Manager | 22nd June, 2015<br><br>(Skype) |
| **F** | Steel fabrication | Internationally and Locally | Director | 24th June, 2015<br><br>Face to face |

Table 4.1 **is designed for the purpose of this research to clearly outline the participants of the cases involved in this study**

## 4.2 Case Study A

### 4.2.1 General Information

Case Study A is an investment holding company, which primarily engages in the manufacturing and trading of steel and steel-related products. The group, through its steel making plant, focuses on the production of steel products ranging from billets and bars to wire rods serving mainly the construction and engineering sectors. The group serves as one of the main suppliers of steel to not only Malaysia but also South-East Asia and Europe.

The interviewee in Case Study A agreed that developing a relationship or partnership in the steel industry is important, as this exists in a niche market. Case A also emphasizes the positive impact of information technology and business intelligence tools and technologies on their business. In fact, these dimensions act as supporting tools to the success of their supplier selection decision-making, supplier selection criteria of other suppliers and their supplier evaluation and audit process. Case A, supports the use of artificial intelligence tools and technologies and believes it will be a useful tool. However, artificial intelligence tools and technologies are viewed as an unknown area that case A did not explore, and in the current times does not view as a necessary tool. These dimensions will be discussed further in the next section.

### 4.2.2 Supplier selection

The figure below represents the evidence map for the supplier selection dimension in Case Study A.

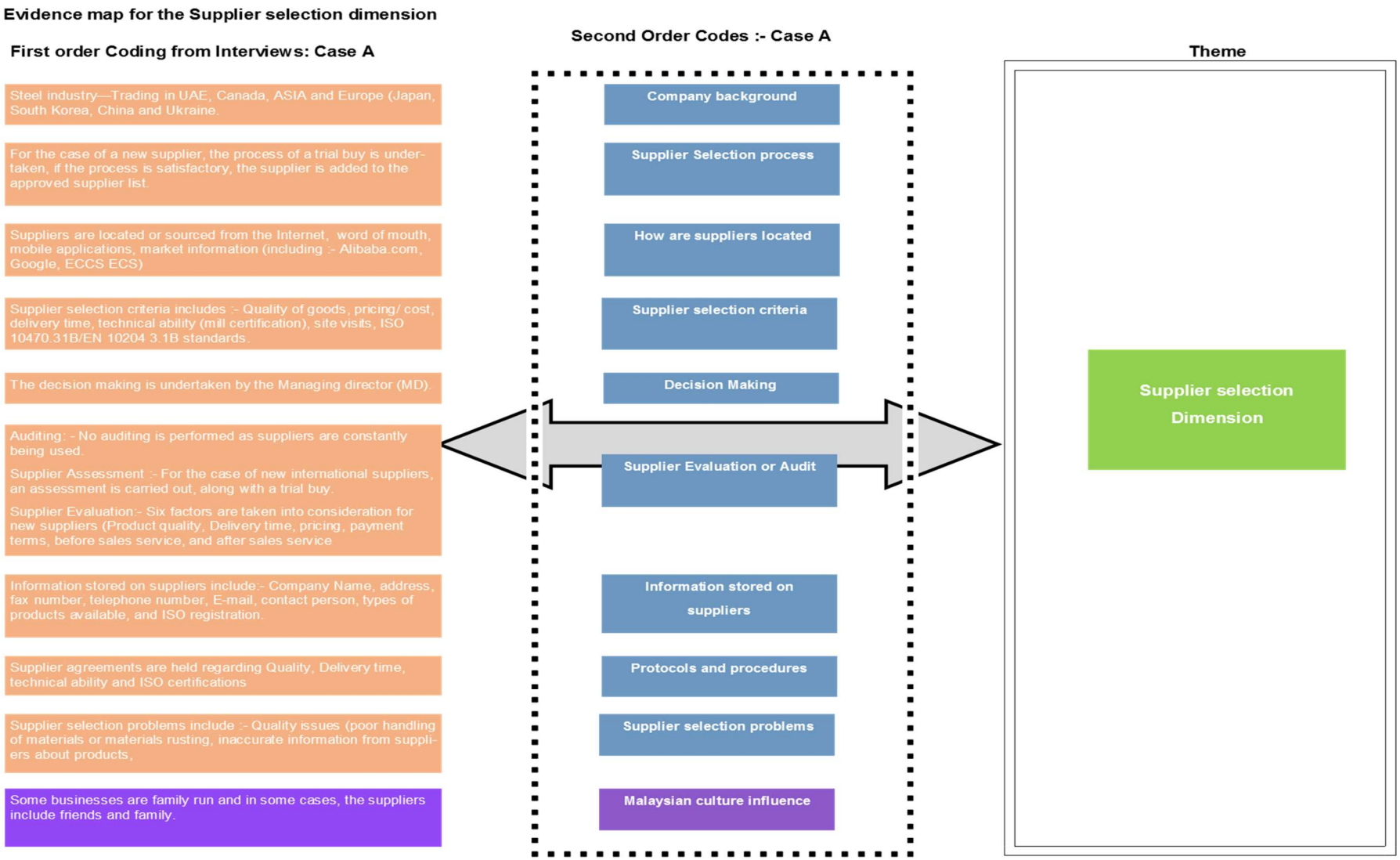



*Figure 4.1 - Derived from empirical data, shows an evidence map for the supplier selection decision making process for Case A*

The above evidence map presents three (3) levels of information, derived from empirical data. The first column, called first order of coding, describes the open coding or “phase 2” derived from NVIVO. These display quotes from the interviewee. The second column, named the “second order codes”, derives from codes developed from drilling down the open codes, and is named “phase 3” on NVIVO. The third column represents the data reduction process, where main themes are shown from drilling down. In the case of this evidence map, the main theme discussed would be “Supplier Selection”.

### 4.2.3 Company Background

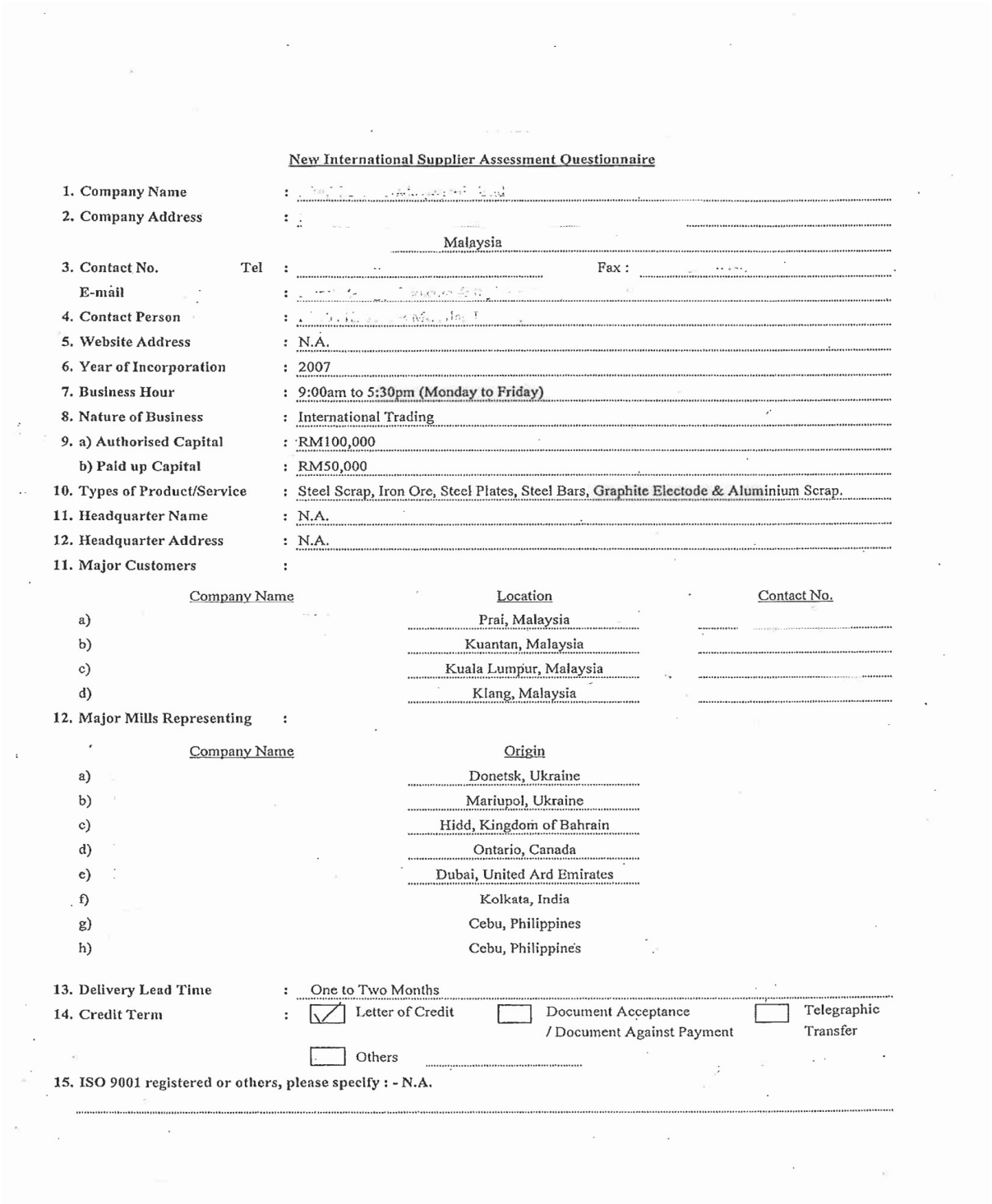
The findings of Case A state that the company operates in the steel industry, which is a niche market industry in Malaysia. Case A highlights the different countries to which trade is conducted, including, the UAE, Canada, ASIA, and European countries.

### 4.2.4 Supplier Selection Process

Suppliers play a very important role in the success of all manufacturing companies, but in Case A, suppliers seek the attention of this steel provider. It is explained that in reviewing suppliers to add to their existing supplier list, a trial buy is undertaken, and in the case of some suppliers more than one trial buy is undertaken. In cases where the supplier is internationally based, a “new international supplier assessment questionnaire” is conducted. This questionnaire allows Case A, to assess their potential supplier. The questionnaire includes, company name, company address, contact details, the nature of the business, their authorised capital, paid up capital (the

authorised amount of funds they will be able to spend), who their major customers are (this assists Case A in credibility of the company, also acting on the “who do you know” way of business”), major mills representing steel companies would usually need to provide a mill certification, which consists of the constitution of the steel and this factor is associated with the supplier selection criteria which will be discussed later on in this chapter), delivery lead time, credit term, before sales service provided, ISO certification and response time to customer complaints. After this questionnaire is completed by the potential supplier, along with a trial buy, a decision is made, which is also shown on the questionnaire.

Two examples of this questionnaire are shown below:



**New International Supplier Assessment Questionnaire**

1. **Company Name** : [redacted]
2. **Company Address** : [redacted]
   Malaysia
3. **Contact No.** Tel : [redacted] Fax : [redacted]
   **E-mail** : [redacted]
4. **Contact Person** : [redacted]
5. **Website Address** : N.A.
6. **Year of Incorporation** : 2007
7. **Business Hour** : 9:00am to 5:30pm (Monday to Friday)
8. **Nature of Business** : International Trading
9. **a) Authorised Capital** : RM100,000
   **b) Paid up Capital** : RM50,000
10. **Types of Product/Service** : Steel Scrap, Iron Ore, Steel Plates, Steel Bars, Graphite Electode & Aluminium Scrap.
11. **Headquarter Name** : N.A.
12. **Headquarter Address** : N.A.
11. **Major Customers** :

| | Company Name | Location | Contact No. |
|---|---|---|---|
| a) | | Prai, Malaysia | |
| b) | | Kuantan, Malaysia | |
| c) | | Kuala Lumpur, Malaysia | |
| d) | | Klang, Malaysia | |

12. **Major Mills Representing** :

| | Company Name | Origin |
|---|---|---|
| a) | | Donetsk, Ukraine |
| b) | | Mariupol, Ukraine |
| c) | | Hidd, Kingdom of Bahrain |
| d) | | Ontario, Canada |
| e) | | Dubai, United Ard Emirates |
| f) | | Kolkata, India |
| g) | | Cebu, Philippines |
| h) | | Cebu, Philippines |

13. **Delivery Lead Time** : One to Two Months
14. **Credit Term** : ☑ Letter of Credit ☐ Document Acceptance / Document Against Payment ☐ Telegraphic Transfer
    ☐ Others
15. **ISO 9001 registered or others, please specify : - N.A.**

Figure 4.2 Example 1 of the New International supplier assessment questionnaire from Case A (Page 1)

| | Yes | No |
|---|---|---|
| 16. Any Brochure or Specification List of product / service specified in item (10) ? | ☐ | ☑ |
| 17. Before sales service provided ? *(Such as Quotation, necessary information of mill certificate, etc)* | ☑ | ☐ |
| 18. Does your company / representing steel mill perform inspection and testing on the product ? | ☐ | ☑ |
| 19. Does the inspection conform to ISO 10470 3.1B / EN 10204 3.1B standard or higher ? | ☑ | ☐ |
| 20. Do you have an effective system for the control of non-conforming product ? | ☑ | ☐ |
| 21. Are your materials and products properly identified and status clearly identified ? | ☑ | ☐ |
| 22. Can you response within 3 days upon order / delivery schedule changes ? | ☑ | ☐ |
| ( If No, specify _____ ) | | |
| 23. Can you response to customer's complaints / feedback and settlements within 1 week ? | ☐ | ☑ |
| ( If No, specify Settlement should be done within 2-4 weeks ) | | |

* *Please provide a copy of the following documents (if any) for our references :*

- ☐ Company Profile
- ☐ Product brochure / specification
- ☐ Quality system certificate
- ☐ Test certicate / records

Kindly ensure all relevant information & certification are completed & attached before submission

**I/We hereby declare that the above information is accurate and to the best of my/our knowledge.**

Confirmed & Completed by (Company Chop) :

Name :
Designation : Executive Director
Date : 2/11/2010

**FOR ANN JOO METAL USE ONLY**

Recommendation *(HOD)*
for purchase of high grade material.

Signature :
Name :
Date :

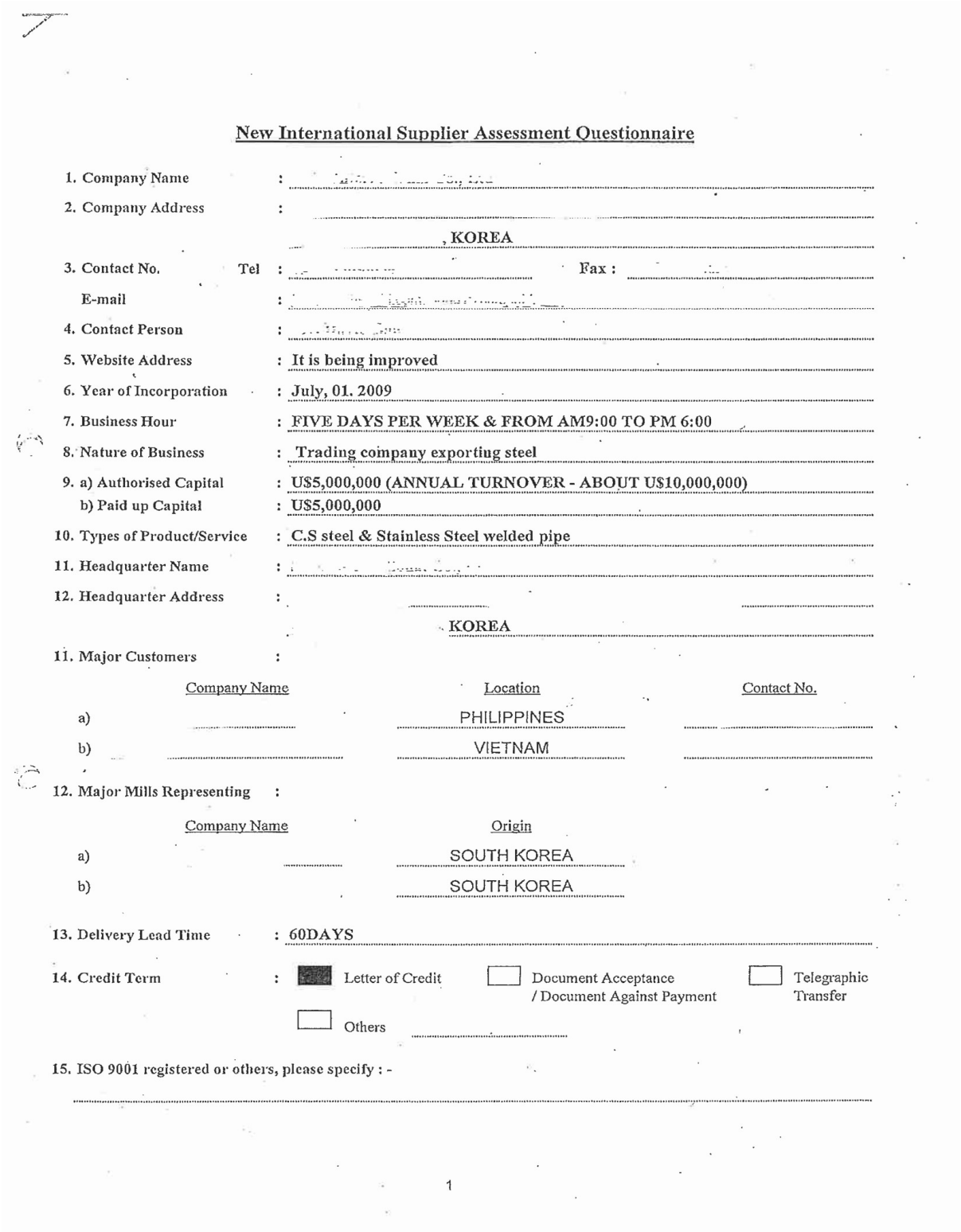
Supplier Selection : Approved ☑ Not Approved ☐
*(Director)* :
Comment : This agent already have dealing with Ann Joo Steel Berhad.

Signature :
Name :
Date :

IPD/ISA/04

Figure 4.3 Example 1 of the New International supplier assessment questionnaire from Case A (Page 2)

Example 2 of New International Supplier Assessment Questionnaire for CASE A



## New International Supplier Assessment Questionnaire

1. Company Name : [redacted]
2. Company Address : [redacted]
   , KOREA
3. Contact No. Tel : [redacted] Fax : [redacted]
   E-mail : [redacted]
4. Contact Person : [redacted]
5. Website Address : It is being improved
6. Year of Incorporation : July, 01. 2009
7. Business Hour : FIVE DAYS PER WEEK & FROM AM9:00 TO PM 6:00
8. Nature of Business : Trading company exporting steel
9. a) Authorised Capital : U$5,000,000 (ANNUAL TURNOVER - ABOUT U$10,000,000)
   b) Paid up Capital : U$5,000,000
10. Types of Product/Service : C.S steel & Stainless Steel welded pipe
11. Headquarter Name : [redacted]
12. Headquarter Address : [redacted]
    KOREA
11. Major Customers :

| | Company Name | Location | Contact No. |
|---|---|---|---|
| a) | [redacted] | PHILIPPINES | [redacted] |
| b) | [redacted] | VIETNAM | [redacted] |

12. Major Mills Representing :

| | Company Name | Origin |
|---|---|---|
| a) | [redacted] | SOUTH KOREA |
| b) | | SOUTH KOREA |

13. Delivery Lead Time : 60DAYS
14. Credit Term : ☒ Letter of Credit ☐ Document Acceptance / Document Against Payment ☐ Telegraphic Transfer
    ☐ Others [redacted]
15. ISO 9001 registered or others, please specify : -

1

Figure 4.4 Example 2 of the New International supplier assessment questionnaire from Case A (Page 1)

| | Yes | No |
|---|---|---|
| 16. Any Brochure or Specification List of product / service specified in item (10) ? | ■ | ☐ |
| 17. Before sales service provided ? *(Such as Quotation, necessary information of mill certificate, etc)* | ■ | ☐ |
| 18. Does your company / representing steel mill perform inspection and testing on the product ? | ■ | ☐ |
| 19. Does the inspection conform to ISO 10470 3.1B / EN 10204 3.1B standard or higher ? | ■ | ☐ |
| 20. Do you have an effective system for the control of non-conforming product ? | ■ | ☐ |
| 21. Are your materials and products properly identified and status clearly identified ? | ■ | ☐ |
| 22. Can you response within 3 days upon order / delivery schedule changes ? ( If No, specify _____ ) | ■ | ☐ |
| 23. Can you response to customer's complaints / feedback and settlements within 1 week ? ( If No, specify _____ ) | ■ | ☐ |

* *Please provide a copy of the following documents (if any) for our references :*

- ■ Company Profile
- ■ Product brochure / specification
- ☐ Quality system certificate
- ☐ Test certicate / records

Kindly ensure all relevant information & certification are completed & attached before submission

**I/We hereby declare that the above information is accurate and to the best of my/our knowledge.**

Confirmed & Completed by (Company Chop) :

President

Name :
Designation : President
Date

**FOR ANN JOO METAL USE ONLY**

| Recommendation *(HOD)* | | Supplier Selection *(Director)* | : Approved ☑ | Not Approved ☐ |
|---|---|---|---|---|
| | | Comment | : | |
| Signature | : | Signature | : | |
| Name | : | Name | : | |
| Date | : | Date | : | |

IPD/ISA/04



**Figure 4.5 Example 2 of the New International supplier assessment questionnaire from Case A (Page 2)**

The interviewee from Case A explains below:

> *"There is a lot we do in the market, and suppliers comes to us and asking us for inquiry, asking us to give them opportunity to quote to us. So most of the time we are not in the market looking for suppliers."*
>
> *"After meeting with the supplier, and we establish who are they, because in most cases we meet with traders, these are the middlemen or these are brokers, especially, they represent the mills. Mills mean the manufacturers in China or in Europe or in Korea, Japan. So if they can perform there, then we'll give our trial order. So we'll do that a few times. Before we are very comfortable with them."*

#### 4.2.4.1 How Suppliers are Located or Sourced

Another factor discussed in this theme of supplier selection is how suppliers are sourced or located, and for Case A, although they do have an existing supplier list, and as previously mentioned, suppliers seek Case A for business, there are some situations where Case A, seeks new suppliers for one-off jobs or if the current supplier fails to provide a service or material. To do so, different tools and technologies are used, including mobile applications, and online tools, including Google, and a popular online market called Alibaba.com. Also, they do look at the stock markets to identify new suppliers so that they can have an idea of their range of products. The interviewee explains below:

> *"We only look into other suppliers, if the present suppliers, that supplies to me fails in their delivery, or we lose confidence in them. Then we start looking for another one. Which we know, there are 3 or 4 in market, that can supply the same material."*
>
> *"We go to Google, or Alibaba and retrieve information from there.*

*The purchasing team also relies on mobile apps so that they can source information about the requirements for different products.*

*But they only go for information as in market information as to how the industry is moving, how steel industry doing, you know. Whether it's going up, it's going down, or maybe stocks. Stocks meaning, looking at the commodities. You see if the nickel price is going up, or copper price is going up, they'll come to, oh the price of stainless steel might go up or come down, you know. It's just an indication. So by looking on those apps, an example of one of the apps is called EC3. They are very good. "*

---

Moreover, more traditional methods are also used to seek new suppliers for Case A by word of mouth, making phone calls to these connections, newspapers. Case A also subscribes to the World Steel Association and Steel First, where they are privy to suppliers of material and services.

#### 4.2.4.2 Supplier Selection Criteria

Another second order theme discussed in the previous evidence map, is the supplier selection criteria. Supplier selection criteria is unstandardized across the Malaysian manufacturing company, and in Case Study A, it was revealed by the interviewee, that the most pertinent selection criteria would be quality, pricing/cost, delivery time, technical ability and in some cases, site visits. The interviewee from Case A explains site visits and technical ability.

## Site Visits

> *"First of all, as I said, most of the mills that we work with are already people we know and we know their background. If it is a new one, there is a possibility that we might go and see. There's a possibility".*

## Technical ability

> *"There are cases when we want a very special steel product. For example, we call it boiler plate. You know, you boil a boiler plate, which is hot. So they mix certain types of steel. You can get a normal boiler plate, but you need a higher credit boiler plate which consists of maize, consists of cube steel, and no nitrogen, things like that. To certain non-dynamical, very specific-to-specific period in the market. That can produce this type of material."*

Another secondary theme described in the above evidence map is, supplier selection decision making; for Case A, the decisions are made by the company's managing director (MD) supported by information from the purchasing team. Case A's supplier selection decision-making and their buying decisions reflect their business model, as being a niche business. The interviewee, referred to Case A as a phase buyer, whereby, they do not operate as some other manufacturing companies where restocking of materials is a constant practice. Case A will only purchase certain materials if needed for a particular project. In some cases, Case A will receive an inquiry.

> *"Decision to buy will come from inquiries. We don't buy and stock. Certain products, the higher we buy, we collect their order. We're in there for specific requirement. Phase buyer, specific customer. So we don't just buy.*
>
> *The normal products we can buy and stock but for specific ones, but for specific projects, then we buy specifically".*

#### 4.2.4.3 Supplier Evaluation or Audit

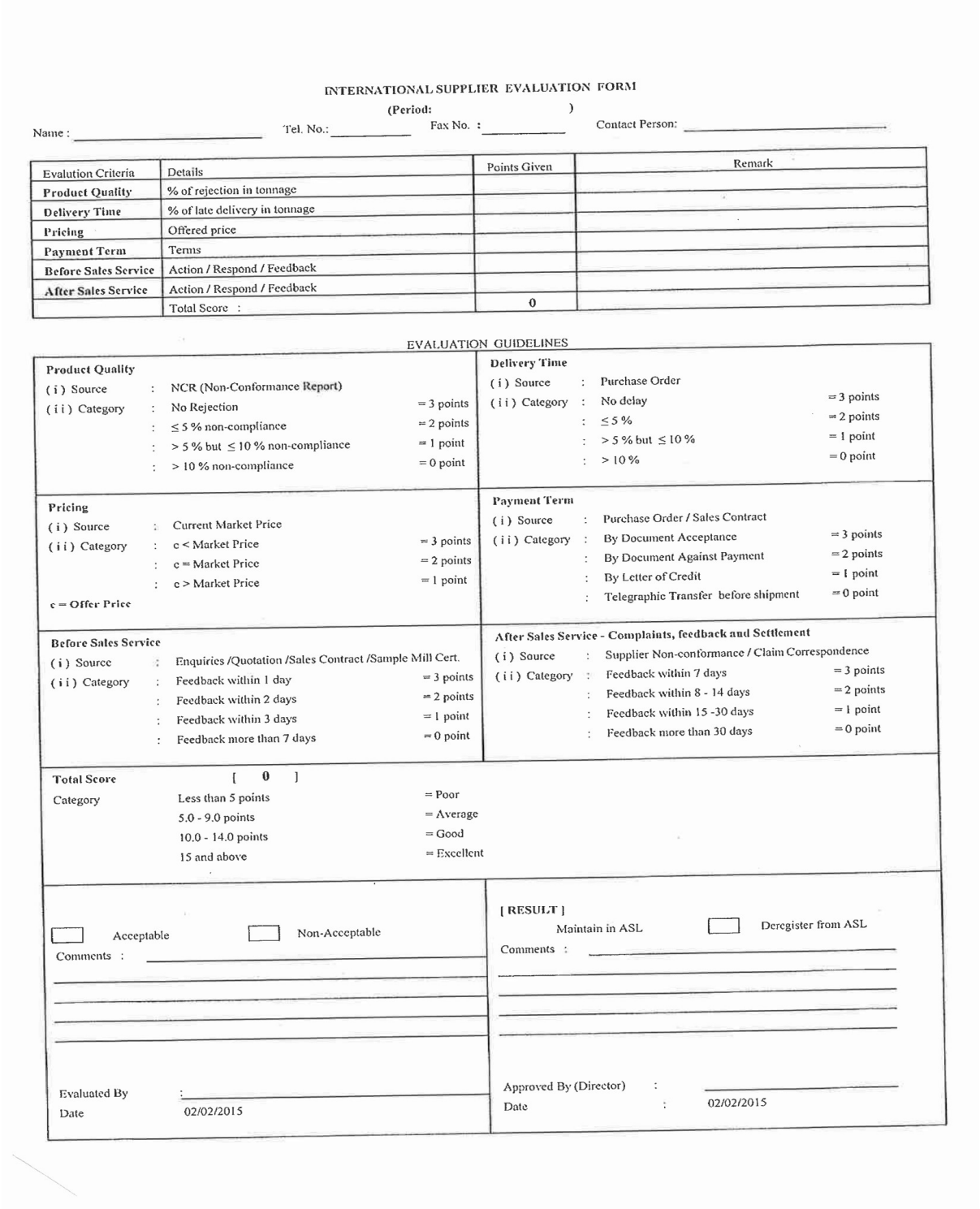
In terms of supplier evaluation and supplier auditing, the interviewee explained their process by establishing a difference between establishing a new supplier and methods used to evaluate, and auditing to existing and current suppliers on their supplier list.

In the case of new suppliers, the evaluation method used is named a trial buy or a trial order supported by a new international supplier assessment form, shown in the supplier selection process (section 5.2.4) by the interviewee.

> *"We do not have a standardised process existing in the company, in fact there is a need for it, for us we are more into trial order sometimes".*

A new supplier will be evaluated by monitoring product quality, delivery time, pricing or cost, payment term, before sales service and after sales service in a time period of six (6) months. To support this process there is a designated form to record the evaluation criteria called the "international supplier evaluation form". This process is conducted using a scoring system, and by assessing the different criteria and providing a total score. The total score is categorised under four areas, for "poor", "average", "good" and "excellent. The director of Case A approves a result on whether the supplier should remain in the "approved supplier list" or not.

The following image provides an example of the international supplier evaluation form used by Case A.



INTERNATIONAL SUPPLIER EVALUATION FORM

(Period: )

Name : _____ Tel. No.: _____ Fax No. : _____ Contact Person: _____

| Evalution Criteria | Details | Points Given | Remark |
|---|---|---|---|
| **Product Quality** | % of rejection in tonnage | | |
| **Delivery Time** | % of late delivery in tonnage | | |
| **Pricing** | Offered price | | |
| **Payment Term** | Terms | | |
| **Before Sales Service** | Action / Respond / Feedback | | |
| **After Sales Service** | Action / Respond / Feedback | | |
| | Total Score : | 0 | |

EVALUATION GUIDELINES

**Product Quality**
(i) Source : NCR (Non-Conformance Report)
(ii) Category : No Rejection = 3 points
: ≤ 5 % non-compliance = 2 points
: > 5 % but ≤ 10 % non-compliance = 1 point
: > 10 % non-compliance = 0 point

**Delivery Time**
(i) Source : Purchase Order
(ii) Category : No delay = 3 points
: ≤ 5 % = 2 points
: > 5 % but ≤ 10 % = 1 point
: > 10 % = 0 point

**Pricing**
(i) Source : Current Market Price
(ii) Category : c < Market Price = 3 points
: c = Market Price = 2 points
: c > Market Price = 1 point
**c = Offer Price**

**Payment Term**
(i) Source : Purchase Order / Sales Contract
(ii) Category : By Document Acceptance = 3 points
: By Document Against Payment = 2 points
: By Letter of Credit = 1 point
: Telegraphic Transfer before shipment = 0 point

**Before Sales Service**
(i) Source : Enquiries /Quotation /Sales Contract /Sample Mill Cert.
(ii) Category : Feedback within 1 day = 3 points
: Feedback within 2 days = 2 points
: Feedback within 3 days = 1 point
: Feedback more than 7 days = 0 point

**After Sales Service - Complaints, feedback and Settlement**
(i) Source : Supplier Non-conformance / Claim Correspondence
(ii) Category : Feedback within 7 days = 3 points
: Feedback within 8 - 14 days = 2 points
: Feedback within 15 -30 days = 1 point
: Feedback more than 30 days = 0 point

**Total Score** [ 0 ]

Category
Less than 5 points = Poor
5.0 - 9.0 points = Average
10.0 - 14.0 points = Good
15 and above = Excellent

☐ Acceptable ☐ Non-Acceptable
Comments : _____

Evaluated By : _____
Date 02/02/2015

**[ RESULT ]**
Maintain in ASL ☐ Deregister from ASL
Comments : _____

Approved By (Director) : _____
Date : 02/02/2015

*Figure 5.5. The above figure shows the suppler evaluation form used for Case A*

The interviewee stated that there is no auditing process conducted on their current supplier list; explaining further that there is no need for auditing as the suppliers on

their list are all in use, and there is no need to perform an audit. It should be mentioned here that, one of the areas discussed, was the accuracy of information on suppliers, regarding contact details. The interviewee stated that most of the existing suppliers have long-standing agreements with Case A, and they are aware through word-of-mouth if any changes are made to their contact person, so there are no data accuracy issues. The interviewee explains below:

---

*"There is no auditing done. So far, I have not encountered any problems in terms of information not being up to date. If the person leaves or a person is not there, then we will know, as our business is conducted through face to face meetings and we will also be aware by word of mouth as this industry is so small.*

*When we make calls, "hey I heard you left. Oh yes, for that, sorry, you know". So it spreads out very fast. It moves very fast. Impossibly fast.*

*Small. Like, like I said this Thursday we're going to have a dinner. We called a manufacturers dinner, where we all sit around and you see the same old faces and start talking. That's how it works. You have to be in the market all the time. That's very important. So that's why we move our sales people into the market, get the information. Like a one very particular sales manager who can get any information just like that. He just gets the information. He knows what's going out in, who has gone here, who has gone there, everything".*

---

#### 4.2.4.4 Information Stored on Suppliers

Following from the above second order codes, another theme discussed is information stored on suppliers; the interviewee stated:

---

*"Definitely name, address, fax no., telephone no, E-mails and the person in charge. That's our best standard information".*

*"In fact we do have a record of usage, I don't think they record it but they would know the number of purchase orders as we discuss the price. So through the number of purchase orders the purchasing department will know".*

---

It should be noted, that this secondary theme of information stored, shares a relationship as understood by the researcher. As previously mentioned by the interviewee, the steel manufacturing industry in Malaysia, is small and niche, where word of mouth is most common in forming business relationships and information transfer is conducted face to face. These factors impact on the information stored on suppliers, and their monitoring process; it can be deduced that this process removes information gathering on suppliers and supplier monitoring, as it is easier to keep up to date with information through word of mouth and face to face contact.

#### 4.2.4.5 Protocols and Procedures

Another secondary theme stated in the above evidence map, is protocols and procedures. Upon analysis during document review, (Figure 5.5), two protocols are inquired upon, ISO 9001 and ISO 10470 3.1B/ EN 10204 3.1B.

The ISO 9001 guidelines "sets out the criteria for a quality management system and is the only standard that can be certified, it can be used any organisation, large or small, regardless of its field or activity. This standard is based on a number of quality management principles including strong customer focus, the motivation and implication of top management, the process approach and continual improvement. Using ISO 9001 helps ensure that customers get consistent, good quality products and services which in turn brings many business benefits".

In adherence to this protocol, Case A, has assigned new supplier assessments as stated in the new international supplier assessment questionnaire as shown in (Fig

4.5), for instance, customer response to customer complaints/feedback and settlement within one week, and if their materials and procedures are properly identified and the status clearly identified.

For Case A, the interviewee mentioned service level agreements, but it is not heavily relied upon. It should be mentioned here, that this is a result of the steel industry being niche and the way that business is conducted in Malaysia.

In discussing problems and/or issues with suppliers, as indicated in the evidence map, the interviewee highlighted the main issue as being quality. Furthermore, the interviewee defined quality into two main areas as explained below:

---

*"Quality issues, because quality comes from 2 errors.*

*One, it could be due to poor handling.*

---

"In the hot mills, they really handle materials very rough. So they have damaged the material, like scratches and dents."

Number two; it could be due to rusting. "If I buy from China during winter or Japan during winter, it's bound to rust, because you are talking about cold country to the hot country, so rust is second, oxidization".

#### 4.2.4.6 Supplier Selection Problems

Another issue arising under this secondary theme, is inaccurate information about new and unknown suppliers. The interviewee states, in past situations suppliers have given Case A incorrect information regarding, the types of materials that they supply and in some cases, even false locations where locations do not exist; as a result of these

past situations, the implementation of the site visit and meeting when considering some new and unknown suppliers is mandatory.

The final secondary theme appearing on the evidence map is a newly emerging theme, “Malaysian culture”. The interviewee mentions throughout the interview, situations regarding the way business is conducted in Malaysia; trust and commitment to family run businesses. These factors also assist in forming relationships with their suppliers. It should also be highlighted as these reasons can lead and influence the success of some Malaysian manufacturing businesses.

These secondary themes will be further discussed and compared with the findings from the other six cases in Chapter Six. The next section will discuss the information technology presence in Malaysian manufacturing companies.

### 4.2.5 Information Technology Presence in Malaysian Manufacturing

A number of views have emerged with regards to the information technology dimension as seen in Figure 4.6. The interviewees commented on factors such as the type of information technology tools used to support their business needs, in some cases lack of information technology with problems and issues faced. Included, would be the newly emerging factor which will be highlighted in blue.

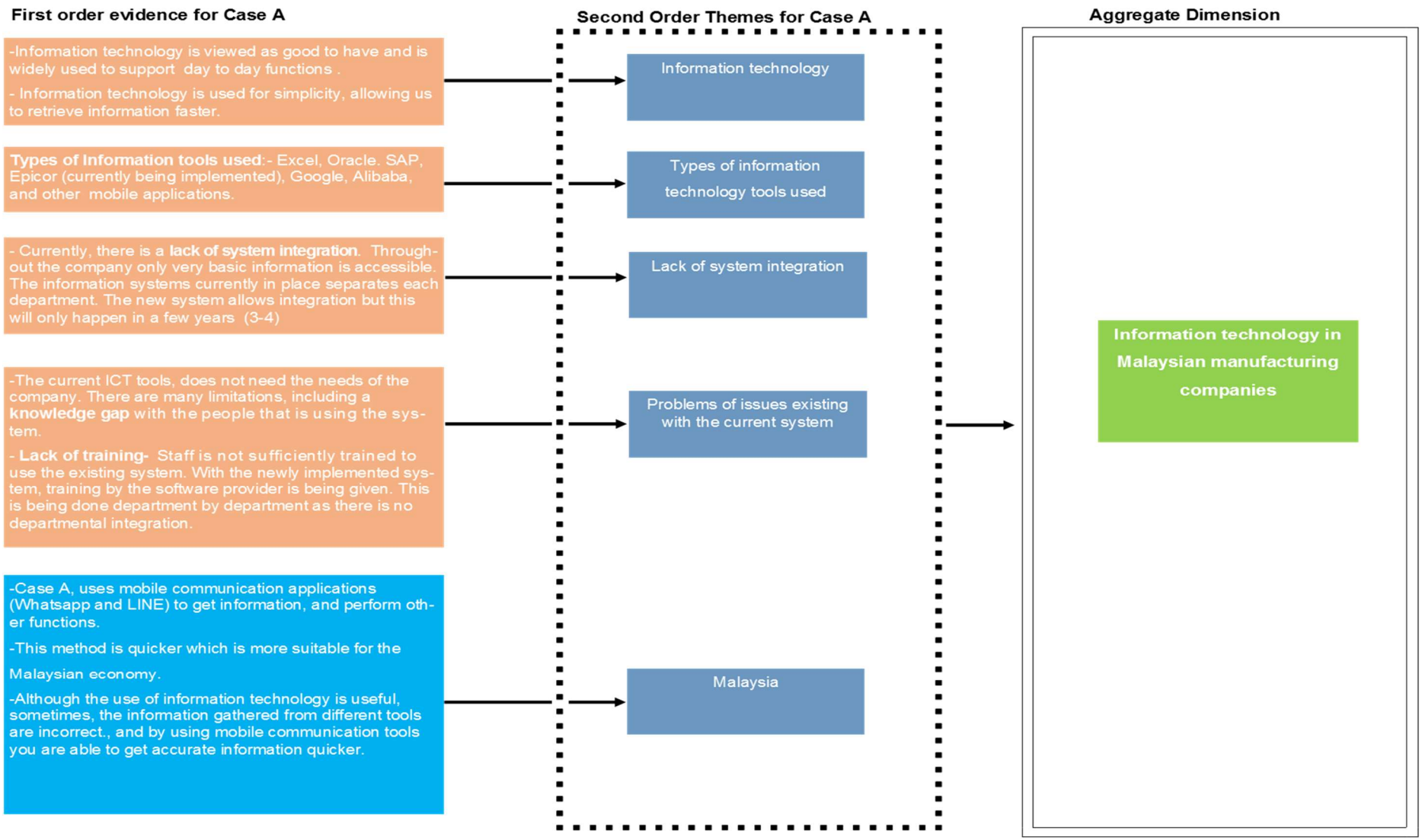



Figure 4.6 Derived from empirical data, shows an evidence map for the Information technology tools presence in Case A

#### 4.2.5.1 Information Technology Usage and Presence for Case A

The information technology presence in Case A, is highlighted as a good tool to have and is widely used throughout Case A to perform day-to-day business activities. In this case, the interviewee explained that there was always an interest and presence in information technology tools and technologies, as the benefits of using these tools are plentiful. For case A, information technology tools and technologies allow for Case A to perform tasks in an efficient manner and most importantly at a rapid rate. This is confirmed by the interviewee:

> *"This is done for simplicity so that we can retrieve information faster".*

#### 4.2.5.2 Types of Information Technology Tools Used

For Case A, day-to-day business operations are supported by more conventional information technology tools, including Microsoft Excel, Oracle and SAP. The interviewee of Case A, supports the use of information technology tools and technologies which has allowed Case A to retrieve information faster, and to store information on their suppliers and in other relevant information concerning their business.

> *"We do keep track of the supplier information through Excel, Oracle and SAP. This is done for simplicity so that we can retrieve information faster and store information on suppliers and other relevant information concerning their business".*

In addition to using the above tools, Case A, has an open minded approach to the use and presence of information technology and tools, in addition to using more conventional tools as stated above, the internet, mobile applications and online marketplaces to support their business and its needs.

Google is a frequent tool used to search for information regarding materials, and information about new suppliers and in many cases, to search for information about new materials when in doubt.

Alibaba.com is a known global marketplace where global trade occurs; categorised for buyers and suppliers. This information tool is frequently used by Case A, to either source new suppliers when there is a need for a new product or material, or to perform a search for a material or product from an existing supplier.

Another supporting information technology tool used by Case A to support their business is the use of mobile applications, as previously mentioned. Case A is aware and is open to the use of information tools and technologies and their advantages.

Mobile applications used include ECCS EC3; this mobile application "*provides a database of hot rolled I- section profiles; cold formed and hot finished tubular profiles as well as a database of mechanical fasters; and calculates the resistance of hot rolled I Section profiles and cold formed and hot finished tubular steel columns"*

*(*Description taken from the application's description). Please see below for a screen shot of the application's page.

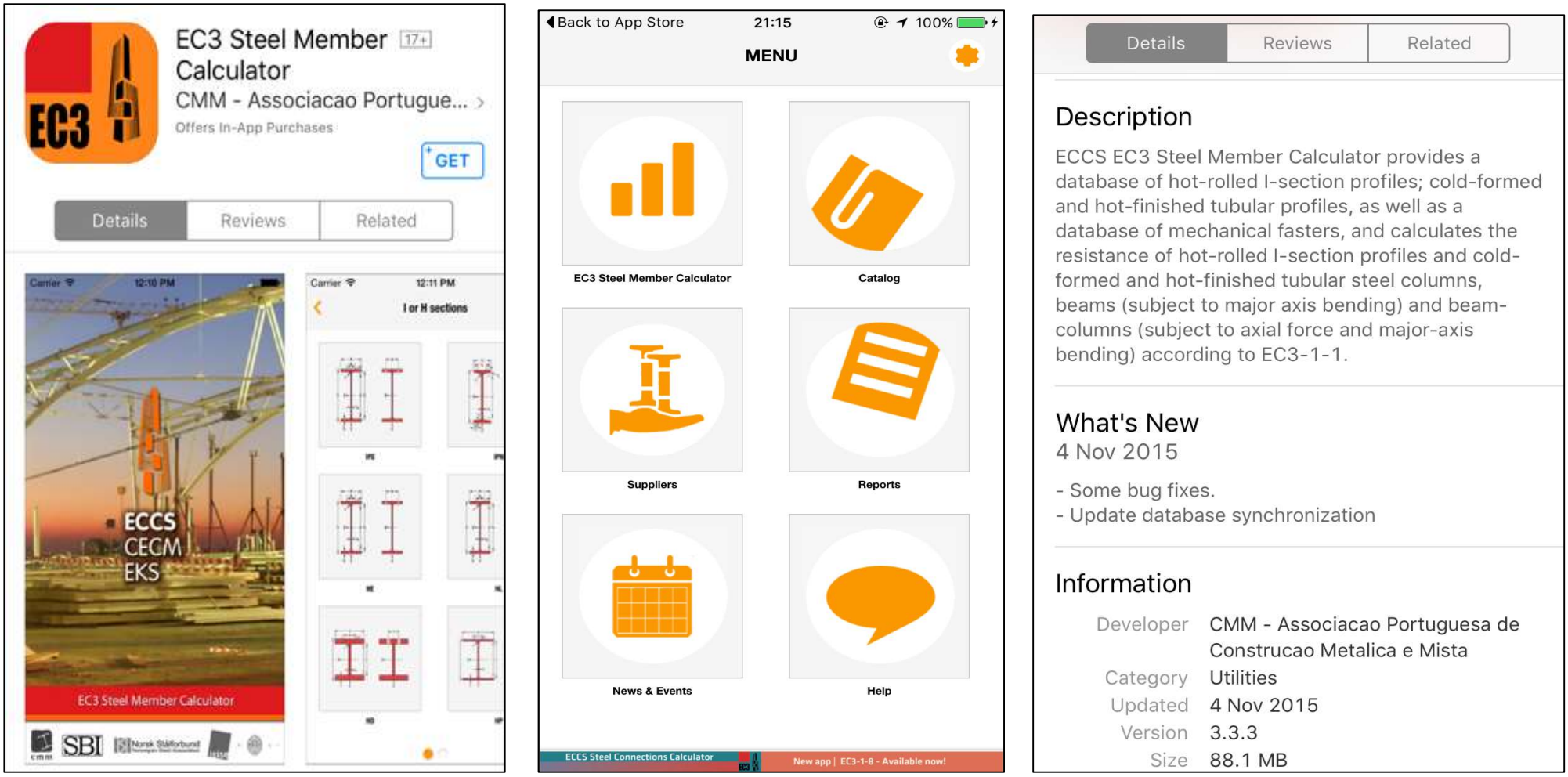



*Figure 4.7 The above figure shows a screenshot of the ECCS, ECS application used by Case A (Information Technology tool)*

The use of these information technology tools are confirmed below:

---

*"We go to Google, or Alibaba and retrieve information from there.*

*The purchasing team also relies on mobile apps so that they can source information about the requirements for different products. But they only go for information as in market information as to how the industry is moving, how steel industry doing, you know, whether it's going up, it's going down, or maybe stocks.*

*Stocks meaning, looking at the commodities. You see if the nickel price is going up, or copper price is going up, they'll come to, or the price of stainless steel might go up or come down, you know. It's just an indication. So by looking on those apps, an example of one of the apps is called EC3. They are very good.*

*The ECCS, EC3, the systems".*

---

---

*"Sometimes, we get a request from someone asking for a particular thing and we do not know what it is, we go on this app and use the application's functions for the requirements for this person. Yeah we go on this app, all the calculations and things like that".*

---

#### 4.2.5.3 Problems or Issues With the Usage and Presence of Information Technology Tools for Case A

##### Lack of System Integration

The previous section explains the various information technology tools and technologies used by Case A. However, the interviewee highlights some problems/ issues with the current system. Case A is using MS Excel, SAP and Oracle as their main information technology tools currently being used. However, these three systems do not allow for system integration, meaning information is not accessible to one another, which results in data replication, data inaccuracy and an overall decrease in

the quality of data. Moreover, one of the concerns of Case A, is data access. In light of this, a new system was sought out by Case A to provide a solution with the above issues. A system called Epicor was implemented. However, with the new system new problems and issues were reported. The interviewee confirms below:

---

"The company has just changed to a software called Epicor. That's an American ERP System. Currently does not meet all of the needs there are limitations because there is a knowledge gap, knowledge gap in the sense that it is something new."

---

As shown above, a knowledge gap with the users or employees of the system is highlighted. The knowledge gap exists due to staff not having the knowledge of the functionality of the system. However, Case A has provided a solution, by providing training to their employees. The interviewee explains below:

---

*"It's an on-going training to the staff. But because it's a new system we just brought in about last year only and then we went live only just months ago.*

*So there's still a lot of knowledge gaps and a lots of parts here and there and a lot of things not so much about this because we changed a new system that can fit into the whole organisation. We are doing this department by department, as currently there is no integration with each department. so integration was important.*

*Important, departments are now being integrated, we would say, okay, we need to improve this and improve that. So, so things will start coming into this. But not at this moment."*

---

In addition to the knowledge gap issue, there is another problem and it is referred to by the interviewee as information capture.

The interviewee explained, that in some cases information is not captured as they would have desired, this is also an issue that needs to be worked out with the vendor of the system. The interviewee explains further:

---

*"Sometimes, it doesn't seem to capture the information that we need. As I say I don't know where are the system parts or system issues or we are not sure. Because as I say, it's still a new system and every day we encounter new problems, sometimes, at certain hours, its closed off. You know. So, so we are not sure.*

*I think it does for lunch, it goes for a sleep and comes back. (Ha ha)*

*So we are still tackling this issue with the vendor (Epicor), they are looking into to why this is happening. So we do have issues.".*

---

To conclude, this section explains some of the main issues with the newly implemented system. However, these issues are being resolved with the vendor who supplied the program to Case A. The interviewee confirms that this new system will solve issues brought to light with system integration and issues with the current system, the interviewee explains:

---

*"It's a very integrated system where we can have a linkage between company A and company B and company C., we wanted to link all of our companies together.*

*I want to be sure that if company A does something with company B, it can be automated or A does something with C, it can be automated. So automation is one of the reasons for changing to this system and to have a more seamless process.*

*So we are looking for stock information and I want to know whether company B or C has stocks of a particular item. This system can also allow me to have access to this information.*

*Very basic information that we need to know across the whole companies.*

*So this system was implemented to integrate everything. It has not been implemented in manufacturing, but it will be soon*

*If we, I would think about 3 years down the road, 4 years, we have to get our system stabilized."*

---

#### 4.2.5.4 Malaysia (The Newly Emerging Theme)

As previously highlighted in the previous sections, Case A is shown to use different information technologies and tools to support their business, moreover, the case supports advantages of information technology and also highlights existing problems currently being faced. In addition to this, a newly emerged theme from the findings shows the importance that Malaysian culture plays on perception of information technology and tools. The interviewee explains that in Malaysia there is always a demand for tasks and business being conducted in a very rapid turnaround time, and because of this, mobile applications were established as a method to execute these functions. Also, the interviewee compared the existing problems in information technology and tools to their neighbouring countries, or competitors in the steel industry (China and Korea), and acknowledging that their use of information technology could possibly be more advanced than Malaysia and possibly no knowledge gap, the interviewee explains:

---

*"Looking at the scale of information technology with these countries are high in comparison to Malaysia, it's a little bit much lower. Much lower."*

---

In addition to comparing with neighbouring countries, the interviewee also compares business with Asian industries and Western industries; the interviewee suggested that western businesses are more organised and systematic, whereas, the eastern way of business and approach is more of "who you know".

The interviewee explains:

---

*"Oh, Eastern is different.*

*They are more organized and systematic and things like that. Ours is more like, human touch and human interaction. In the Asian industries, it is more about who you know and who knows you."*

---

The next section will explain the Business Intelligence presence in Malaysian manufacturing companies.

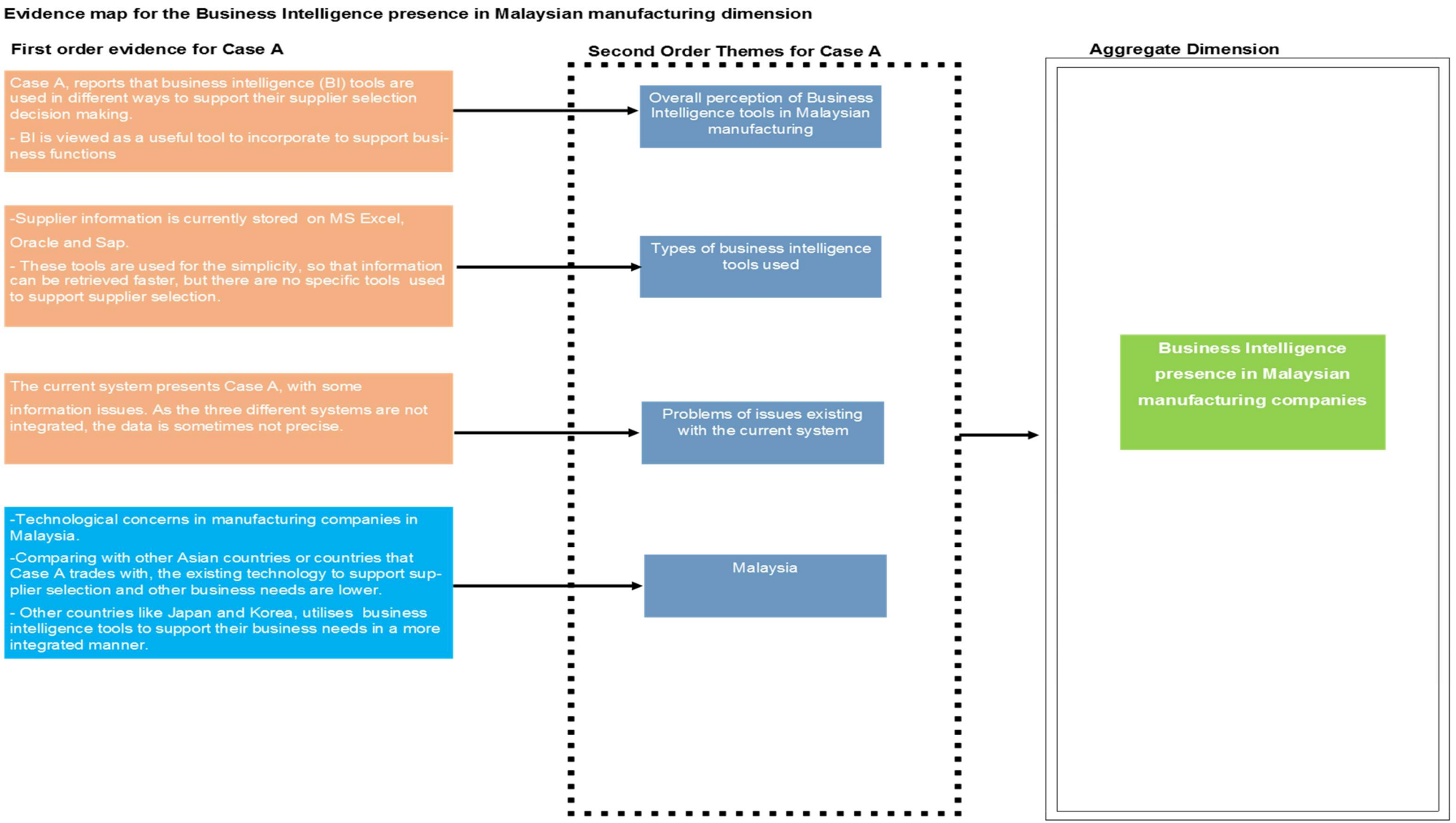



Figure 4.8 The above figure derives from empirical data. The figure shows the evidence map for the Business Intelligence usage and presence in Case A

### 4.3.6 Business Intelligence in Malaysian Manufacturing

The above evidence map shows the main findings of Case A for the Business Intelligence dimension. This section will discuss the first order evidence which is taken from the text of the interview, and themed under the second order themes which categorises the test from the interview.

#### 4.3.6.1 Overall Perception of Business Intelligence Tools in Malaysian Manufacturing

In Case A, the interviewee supports the use of Business intelligence tools and technologies (BI), to support their supplier selection decision making, and supports that BI is a useful tool to incorporate into the business to support all business functions. The interviewee explains below:

> *"This is something we are looking into. I think, it's something good to have but is not legit to have here in the Malaysian economy."*

#### 4.3.6.2 Types of Business Intelligence Tools Used by Case A

In the previous section, the interviewee highlights that business intelligence tools are useful to business needs and would be useful in the decision making of supplier selection. In this section, the business intelligence tools will be explained.

Currently, three main BI tools are being used to support the supplier selection decision-making process; Microsoft Excel, SAP and Oracle. The interviewee explains:

*"We do keep track of the supplier information through Excel, Oracle and SAP. This is done for simplicity so that we can retrieve information faster, but we do not have specific tools or software just to do this."*

As the above quote suggests, these three tools are used to support some of the supplier selection decision-making, by using these tools to track their suppliers, this is done by keeping track of purchase orders, on SAP and Oracle, and by their existing supplier list being recorded as a database on MS Excel.

The information stored on these suppliers is stated below:

*"Name, address, fax no., telephone no, E-mails and the person in charge. That's our best standard information."*

*"In fact our usage, we normally, I don't think they record it up but they would know the number of purchase order we give to discuss the price. So through the number of purchase orders the purchasing department will know."*

Currently, Case A has identified that there is a need for a system that would be able to manage their supplier selection decision-making process, thus, the implementation of an American based software called Epicor was implemented to support their managerial and other business needs.

In the following section, the problems experienced with the existing system will be discussed.

#### 4.3.6.3 Problems and Issues Existing With the Current System

The above section discussed the types of business intelligence used by Case A,

including their current system and mentioning the new business intelligence tool that is currently being implemented. Case A identified a need for a system that was more suitable to their business needs. Currently, one of their main issues is a lack of an integrated system; for the case of supporting the supplier selection process, there are three tools that are being used, and there is a lack of connectivity between them, this leads to incorrect data, data repetition, data exclusion, and a lack of a streamlined process. Another frequent occurrence relates to data being inputted three times into three different systems. Information sharing is also another important aspect to Case A, as they trade with countries in Asia and Europe, their vision extends to a system that would be accessible to their sales representatives and management in foreign countries. For this reason, EPICOR was implemented; EPICOR provides various services to companies including, customer relationship management, financial management, mobile applications, project management, supply chain management to name a few. These different solutions are currently being implemented by Case A, and training is currently being provided to their staff to eliminate the knowledge gap.

---

*"All information. Assuming tomorrow, I will send out a representative in America, we both can still can use this system.*

*They can assess all from America and see whatever is good.*

*As well as everything down the road like human resources, and all other departments, currently it is the Purchasing, stocks and accounts.*

*So its just purely for supplier and sales".*

---

#### 4.3.6.4 Malaysian Influence

Although the interviewee of case A views business intelligence as a supportive tool to support supplier selection and other business operations, he explains that business information tools are not suitable for Malaysia.

---

*"I think, it's something good to have but is not legit to have here in the Malaysian economy. It's not the usual. As I mentioned earlier, for the steel business we are aware of the suppliers, we know the players in the market.*

---

The next section will describe the presence of artificial intelligence in Case A.

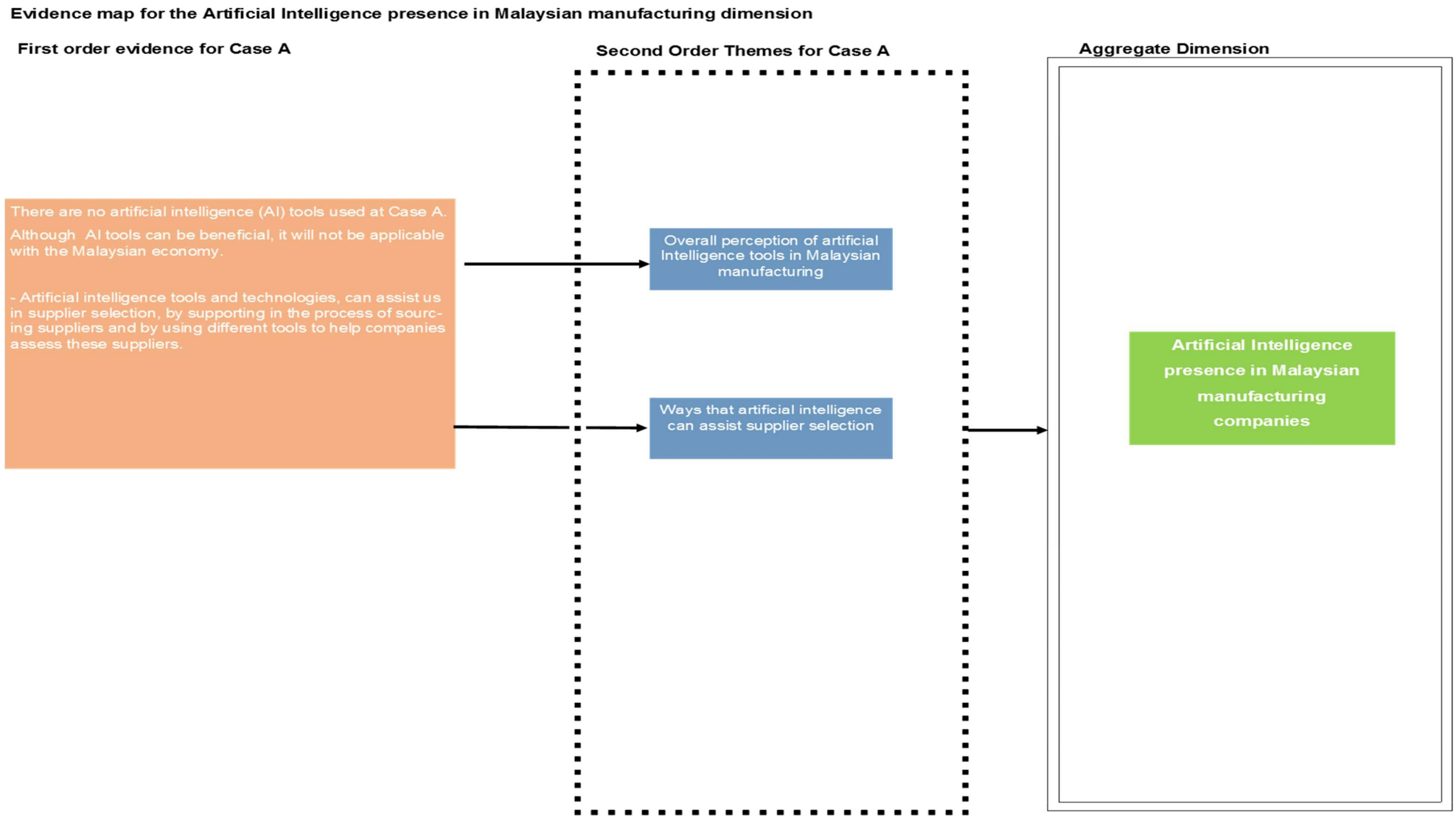



*Figure 4.9 The above evidence map derives from the empirical findings of this study, showing the usage and presence of Artificial intelligence tools for Case A*

### 4.4.1 Artificial Intelligence Presence in Malaysian Manufacturing for Case A

This section will describe the artificial intelligence dimension for case study A. The above evidence map highlights the main findings for this dimension; for the first order of evidence will discuss the presence of artificial intelligence in case A, the second order themes is described in two main themes and they both will describe the main findings for the aggregate dimension.

### 4.4.2 Overall Perception of Artificial Intelligence Tools in Malaysian Manufacturing

Case A interviewee states that there is no use or presence of artificial intelligence tools or technologies used in this company.

The overall perception of artificial intelligence tools to the interviewee, is that these tools would be widely beneficial, but it would not be applicable to the Malaysian economy. The main reason for this is, Malaysian businesses are usually driven by who you know in the business, and referred to by the interviewee as “human intelligence”. Moreover, Case A, already incorporates a wide range of information technology tools, business intelligence tools, and mobile applications, so that the implementation of artificial intelligence tools does not seem appropriate to suit the business needs of Case A. The interviewee states below:

---

*“This is something we are looking into. I think, it’s something good to have but is not legit to have here in the Malaysian economy.*

*It’s not the usual. As I mentioned earlier, for the steel business we are aware of the suppliers, we know the players in the market.”*

---

The interviewee also speaks about data accuracy in relation to artificial intelligence, whereby the information that needs to be inputted to the artificial intelligence tool needs to be accurate, whereas, the interviewee states that information can be sourced from the Internet.

---

*"That's difficult question to answer. It's that it, definitely there'll be flaws, you'll see that. If we look at human intelligence, get information, you may feel this particular practice is, hey, you buy from John, he is good and she can provide you some,*

*If you go into, so called software, where you are trying to collect all this information, how accurate it is, I'll not know because you are to put into the system.*

*But Malaysia, I can answer you because what, if you can use a search engine, you can easily tell who gives more.*

*So I do not think by using artificial intelligence or business intelligence tools, it will definitely help."*

---

To summarise this section, the interviewee states that artificial intelligence tools could be useful, however, it would not be suited for Case A, and Malaysian business practice. The following section will highlight the ways that artificial intelligence can be used to enhance the supplier selection decision-making process for Case A.

## 4.5 Case study B

### 4.5.1 General Information

Case B is an international metal fabrication and furniture company in Malaysia, supplying furniture to hotels, hospitals, offices and universities.

The factory is built up of a production floor that spreads to an area of 25,000 square meters, which consists of 12 thoughtfully designed production chains that allow simultaneous customization jobs to be performed without interrupting the flow of standard production. With the latest machineries used in metal fabrication such as robotic welding and laser cutting machines, SKS is able to produce quality and precise furniture to specifications. An in-house powder epoxy as well as polyurethane forming production lines are also set up to provide additional customization flexibility of colour or cushion density to clients. Servicing 7 specific sectors under its own branding, SKS Group has every solution for projects of all sizes. SKS HOSPITALITY - hotel furniture & equipment SKS KITCHENER - buffet-cooking stations & equipment SKS GAMING - casino operational furniture SKS U-PLAN - office furniture & partitioning SKS HONOUR - laboratory & institutional furniture SKS MEDITRON - hospital beds, trolleys & furniture SKS TECHTRON - custom design metal works & structure.

In this case, the topics of supplier selection, information technology, business intelligence and artificial intelligence were discussed. The interviewee discusses processes, problems, and procedures. In addition, an emerging theme develops regarding Malaysian culture, and its impact on the day-to-day business.

### 4.5.2 Supplier Selection

The below evidence map will highlight the main findings of supplier selection. The first order codes represent quotes from the interviewee (in orange), the second order codes represent the categories the codes are coded into (in blue), and the final column represents the theme (in green). The new emerging theme will be represented in purple.

The below diagram presents the evidence map for the Supplier selection dimension for Case B.

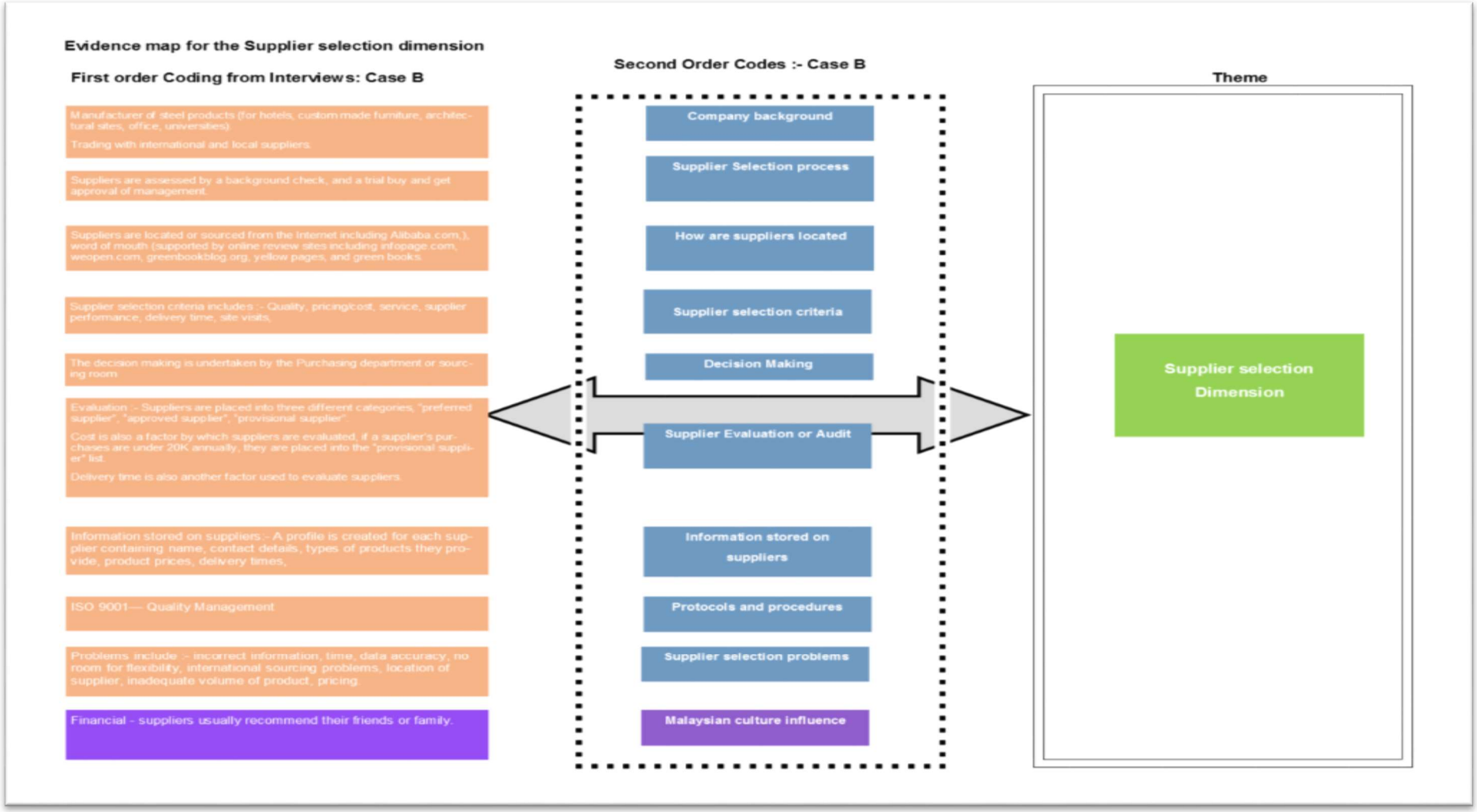



*Figure 4.10 The above evidence map derives from empirical data and shows the findings for the supplier selection decision making process for Case B*

### 4.5.3 Company Background

Case B, is an international provider of steel products to different industries, including hotels, custom made furniture, architectural sites, offices and universities to name a few.

The interviewee explains:

> *"Our company is manufacturing furniture which we have, have different-different sections where we manufacture that furniture for hotels, for medication and custom made, custom made furniture and architectural site. That furniture for office, office use. For that, for university, and all kinds of those you can see them generally. Okay? And of course we have our different-different divisions, groups, I mean teams, individual teams. We charge for individual division for sales and marketing. And of course even though we are in different divisions but of course most of the time if there is any information that is related to different-different divisions, we also sharing for the latest update of information".*

In the above quote the interviewee also gives some insight into the overall structure of the company, by supporting that the company consists of different divisions and groups. In addition, the interviewee continues to explain their purchasing department, as follows:

> *"In purchasing we have a total four different purchasers. Okay? Individual in charge for individual section. Okay? But of course, like all that information from like, we are also sharing for the supplier information, okay? Like from what you see that the raw material is the first most important material that we are looking for. Because purchase the most is the raw material. Like the steel."*

As previously mentioned Case B, has an international presence. However, for the purchase of material for their business the preference for trading is in Malaysia.

The interviewee explains:

> *"Local mostly.*
>
> *Most of locally.*
>
> *Some we do in foreign but generally we try to buy locally".*

The following section will discuss the supplier selection process.

### 4.5.4 Supplier Selection Process for Case B

For case B, the interviewee explains that they have many suppliers on their approved supplier list, due to the wide range of products the company manufactures.

Moreover, one of the main areas that is looked at in their supplier selection process is the ISO procedures and protocols, for quality, service, and health and safety.

The interviewee states below:

> *"Supplier process, actually we have a four of ISO's with our company that is ISO procedures that normally we perform".*

In addition, interviewee explains that the supplier assessed by examining the background of the company quality and pricing, the interviewee explains below:

> *"Basically it depends on, we have to study that company, the background of the company because the stability of the company itself is very important to us. So, I*

*mean, before we consider that company, we have to try to understand that company's function and this because it's one of the liability for the supply and all this and whether they are, and after that we will go for the, of course the quality and the pricing".*

#### 4.5.4.1 How Suppliers are Located or Sourced

Case B, explains that suppliers are sourced and located by different methods, the internet being one of the primary methods. The interviewee explains in the following quote:

*"Yes, we also look into the internet to source from there"*

The Internet provides different methods for suppliers to source and locate suppliers. In addition to sourcing, some global marketplaces, such as Alibaba.com provide feedback from previous customers, about service, speed of delivery, and quality. This is used as a reference for Case B. The interviewee explains below:

*"We also look into the internet to source from there, those from Alibaba.com, a lot from there, we can see the majority of suppliers.*

*Mostly for plastic, unusual plastic. Sometimes we have crisis for putting out unusual plastic "*

*"Most for my site, mostly I will try for the internet to see what are the other buyers' comments. Because maybe they have a past experience, a lot there from there or else maybe we can get some info from there as a reference before we move to dealing with the suppliers. "*

In addition to the use of the Internet, the other sources used by Case B include, online information pages (infopage.net.my and weopen.com), greenbooks (greenbookblog.com) and the yellow pages.

The interviewee states below:

---

*"The website like infopage, we open, greenbooks,*

*some supplying yellow pages, yellow-pages, all this".*

---

The info page used most commonly by Case B, gives a directory of materials and suppliers that is pertinent to their manufacturing needs.

A print screen of the webpage is seen below:

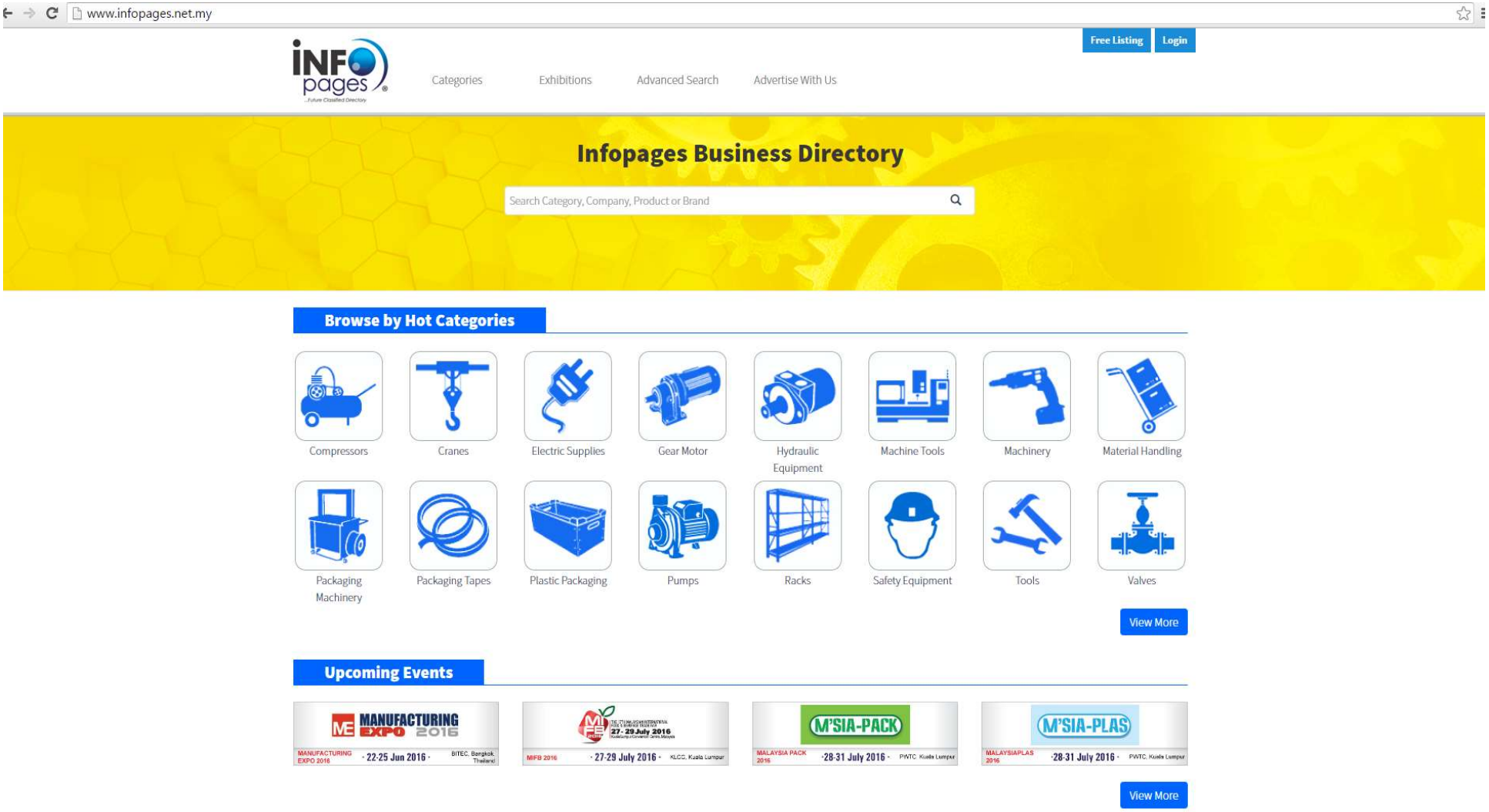



*Figure 4.11 Screen shot of a supplier sourcing method, the info page.*

Another method of supplier sourcing or locating would be from word of mouth. In the event that a supplier is required for a particular item, to save on time, Case B would approach their current suppliers and ask for a recommended supplier for that product.

In other situations, other suppliers will seek the advice of Case B, for their recommendation of suppliers. The interviewee explains below:

---

*"Sometimes we'll exchange the information. Maybe they'll get from some other sites, they'll get the, I'll introduce the client "*

*"Sometimes our local supplier also will introduce us".*

---

Another form of locating suppliers used by Case B, would be the use of steel associations on the internet. Case B, explains that the steel organisation would list companies, and their existing products, along with contact details, and in most cases, if these companies exist in the association they would be legitimate companies. The interviewee explains further:

---

*"Yeah. Because there are some, like, steel society a lot from there. We can know more. Okay? Or sometimes we know the certain grand a lot. We'll try to maybe contact to the HQ and from there they will refer their distributor, representative office, sales office locally and all this. So from there it's more, more easy to get sources."*

---

The participation in exhibitions is another form of supplier sourcing and locating for Case B, not only does it allow them to source new suppliers, it also gives them the opportunity for them to sell their services to organisations to seek their services.

The interviewee explains below:

*"We go for the exhibition and all this. We need to know the new suppliers, and even some new suppliers that get known to our company, they will try to quote, to fix the employment. Yes and send their catalogue and all this to introduce themselves to us and from there when the projects come, we'll meet them us to see. Do site visits."*

In this section the methods by which case B source and locate their suppliers are stated, the use of the online global marketplaces such as Alibaba.com, yellow pages, green books, word of mouth and exhibitions are all methods used to locate suppliers. It is important to Case B to review and perform a complete background check on each supplier. Without performing these relevant checks, problems and issues arise, these problems will be discussed later on in this section. In the following section the supplier selection criteria will be discussed.

#### 4.5.4.2 Supplier Selection Criteria

As previously discussed in the company background section, the nature of the business of Case B is stated. This company is a project-based company, which supplies products including furniture, equipment, and other products primarily to hospitals, and universities and other industries. In light of this, their main focus on supplier selection criteria would include quality, pricing and cost, service, supplier performance, delivery time, and site visits.

In some cases, the supplier selection criteria would be altered to meet the time constraints of their project based work. The interviewee states:

*"The criteria will not be the same thing that every time we purchase. Not the same. Every time is different-different and some of, our divisions they are different, and so maybe their usage. Of course some item like raw materials is a must to purchase".*

This section will explain the different criteria supported by quotes from the interviewee.

## Quality

Quality has an impacting factor on the cost of their product, and most importantly the reputation of the company and the manufactured product. For Case B, as the nature of their business is providing products to universities and hospitals primarily, one of their most important criteria is quality. The interviewee explains below:

> *"We have to try to understand that company's function and this because it's one of the liability for our supply chain, Its quite, it's one of the important criteria for us".*

The interviewee explains that in project-based businesses, the three main criteria, usually most important, would be quality, pricing and delivery time. When purchasing from a supplier, these three selection criteria are assessed, and in some cases, in accordance with how quickly the item is needed, Case B would be inclined to purchase an item for a higher cost, to enable a quicker delivery time. However, quality is a criterion that is never compromised. The interviewee explains below:

> *"No. Because the quality is of course the most important, if we purchase they are able to supplying to us for with low quality material we will not consider booking".*

Following on from quality, another main criteria for Case B is cost and pricing, the section below will present the findings for cost/pricing.

## Cost/Pricing

To Case B, cost/pricing of materials is one of the main criteria used to assess a supplier. As previously mentioned in the introduction of the Case study B, the nature of their business is project based work, and because of this, their business needs to produce their products within a specific time. The interviewee explains below:

> *So, I mean, before we consider that company, we have to try to understand that company's function and this because its one of the liability for the supply and all this and whether they are, and after that we will go for the, of course the quality and the pricing*.

The interviewee identified that the main raw materials used to produce their products includes, rubber, steel and plastic, all of which is available in Malaysia. In the supplier selection section of this case, the interviewee mentions that most of their suppliers are locally based. As raw materials are sourced locally, this aids in keeping down the purchasing cost for Case B.

Another important factor considered when selecting a supplier for Case B, is delivery time. This will be discussed further in the following section.

## Delivery time

As previously highlighted, due to the nature of the business of Case B, the main criteria used to assess a supplier is delivery time, cost/pricing and quality.

This section will highlight the interviewee's perspectives on delivery time.

The interviewee explains that with project based work, there will always be a time constraint on manufacturing a product, and to complete each project, access to raw materials is important. When raw materials are required, case B views delivery time as one of the most important criteria. The interviewee supports below:

---

*"Yeah, yeah, not the same thing that every time we purchase. Not the same. Every time is different-different and some of, our divisions they are different, and so maybe their usage. Of course some item like raw materials is a must to purchase. Other than that there is still a plenty of things like fabrics and Plastic bags.*

*Plastic bags for all this, all different-different.*

*But the criteria would still be the same, delivery time is always going to be number one".*

---

This section highlights the importance of delivery time to Case B, in the following section technical ability or technological attributes will be discussed.

### Technical Ability/ Technical Attributes

In this section, the criterion of technical ability/ technical attributes will be discussed. Due to the nature of their business, this criterion is important to Case B. As previously mentioned in the company background, Case B is a manufacturer of equipment to hospitals, and universities to name a few. In the production of these products, a knowledge of technical ability is vital to the production of the end product. The interviewee explains below:

---

*"For us more and more item is based on the project baseline. That's why we've got a lot of this drawings that incur. That's why we have to invite our suppliers to come down to sit down with our marketing and our engineers and our research and development team (R&D) to sit down to understand the things and for the discussions of the details. Yeah. That's why, like just now you mentioned that how we get to know the supplier and the procedure to approve the new supplier.*

*Sometimes there is not only for the people to get the approval and all this because all this we have to go through a long process for the discussion and all this because its not only for the purchasing itself. Of course our GMs and our engineers, our R&D plays very important role in purchasing. Partly because you need to actually innovate the materials that you are buying and then take them to*

*Yes. And some, some of the chemical things that maybe from there, they'll get more information rather than".*

---

In this section the importance of technical ability was presented, and the following section will showcase state financial stability.

### Financial stability/ Company performance

Company performance or financial stability of a supplier is another criterion that is assessed for Case B. The interviewee highlights below:

---

*"the company performance is also one of the Criteria*

*Yeah, criteria that we are considering. Also, payment terms and all this is also one of the criteria that we will consider".*

---

This section highlights the financial stability or company performance criterion that are important to Case B. The following section will discuss the decision making second order code, shown in the above evidence map (Figure 4.10).

### 4.5.4.3 Decision Making

In this section, the decision making of the supplier in Case B will be discussed.

For this case, the decisions are made through a procurement team. Due to the nature of their business, the procurement team is divided into four different purchasers, who

are then responsible for purchasing different types of material. In this way, each divide will have an understanding of technical ability, past transactions, ability to negotiate delivery times, adhere to quality standards, and be able to obtain the best price. However, in many instances, each person or team would share information when necessary.

The interviewee explains further:

> *"Yes, like in purchasing we have a total four different purchasers. Okay? Individual in charge for individual section. Okay? But of course, all that information we are also sharing for the supplier information, okay?*
>
> *The raw material is the first most important material that we are looking for.*

Moreover, the decision to approve a new supplier would also be made by the purchasing team. In the following section, supplier evaluation and supplier audit will be discussed.

#### 4.5.4.4 Supplier Evaluation/ Supplier Audit

Previously, in the section "How Suppliers are Located", the interviewee states that most of their suppliers are locally situated. For most raw materials that is required for the production of their products, Case B mostly uses the same suppliers frequently. However, the interviewee states in the above section "how suppliers are located", that they are always looking for other options, that would be able to give them the best quality, for the best price. In addition to this, each supplier on their approved supplier list (ASL), is evaluated on a yearly basis.

Each supplier is evaluated using the criterion of cost, meaning, how much business is conducted with each supplier on a yearly basis. Case B, removes suppliers that have not met a 20 thousand spend in one year, for the rest of the suppliers, the record of their purchase orders are examined on their performance (i.e. amount of business that is being conducted), if the performance of the supplier remains over 60 percent, the supplier will be classified as an “approved supplier”, if the performance rating is over 75 percent, the supplier is classified as a “preferred supplier”, if the performance is under 50 percent, the supplier is then placed into the “provisional supplier” list, and will be reassessed in six months. After this process is completed, the lists are then submitted to the manufacturing director.

The interviewee explains below: -

---

*“Majorly we’ll put suppliers in -different categories which rather is preferred, approved, provisional”.*

*“This three we place our suppliers and perform a supplier evaluation.*

*But how the rating for this three category is like, we would put into three balance, the purchase for each year, more than twenty thousand.”*

---

---

*“Below 20 thousand, we will not evaluate because we’ve got too many suppliers. We’re unable to really go into all of them”.*

*“For every year we have update. Of course some, like performers, are very lousy or there is a onetime use, then we’ll erase off at least a few hundred”*

*“I just want to show you is like the figure we purchase a year is within the range from 20k to 50k like we’ll select two purchase orders from that year and 50k-100k is 3 purchase orders and above 100k is 4 PURCHASE ORDERs from there. From the purchase order records we can see how the supplier performance, based on the*

*purchase rate until the delivery date. So from there, of course, in the ISO, the pricing is not much we chew because they small on quality and all this thing."*

*"So from there we will select, we will tick off the, when we do pick a few according to the base and we'll summarize it up and see how their performance is. From there we'll put everything".*

---

The diagrams shown below represent the supplier evaluation process for Case B. The first diagram, will represent the classification table for supplier evaluation and the second diagram will represent the approved supplier yearly evaluation flow chart as explained earlier in this section.

Classication Table for Supplier Evaluation

| Criteria | Action to be taken | Supplier Classification |
|---|---|---|
| If rating* greater equal to or greater than 75% | Put into List of Suppliers and Vendors | Preferred Supplier |
| If rating greater than 60% and equal to or less than 74% | Put into List of Suppliers and Vendors | Approved Supplier |
| If rating less equal to 50% or less than 60% | Put into List of Suppliers and Vendors (Supplier Re-assessment to be done in 6 months) | Provisional Supplier |
| If rating less than 50% | Remove from List of Suppliers and Vendors | |
| New Suppliers that are approved | Put into List of Suppliers and Vendors | Approved Supplier (New) |

* Rating refers to sum of product quality rating , pricing rating , delivery rating and service rating

Supplier Classification Definition:-

| | |
|---|---|
| *Preferred Supplier* | *Suppliers or Vendors are eligible to be recommended for all new businesses* |
| *Approved Supplier* | *There will typically be no change in terms of priority of awarding new business to these suppliers* |
| *Provisional Supplier* | *These suppliers will still be given new business but will be reassed in a period of six months and if there is no improvement, they will be remove from the List of Suppliers* |

*Figure 4.12 Document to show the supplier evaluation process of Case B*

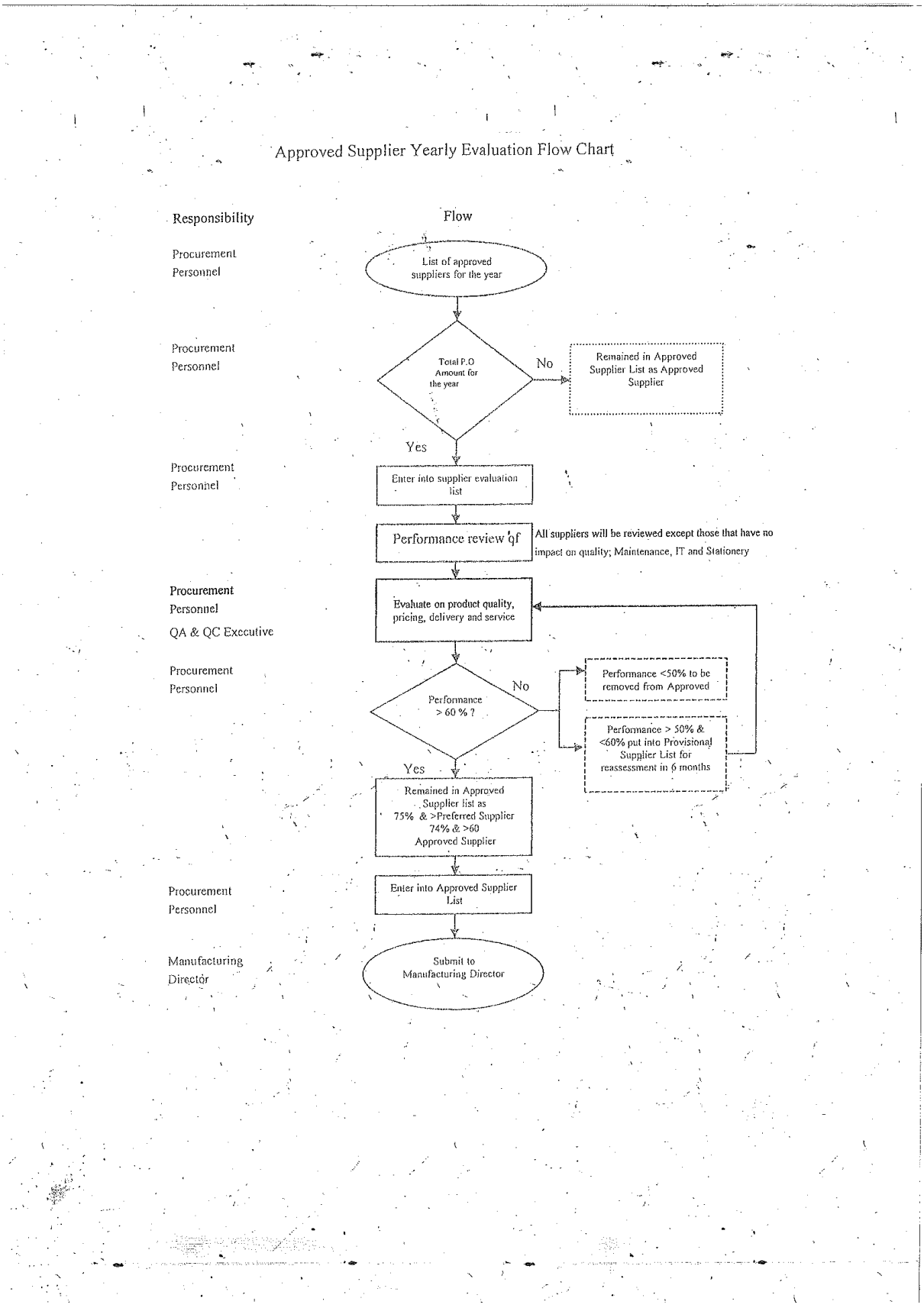



*Figure 4.13 Document to show the Approved supplier flowchart for Case B*

In this section, the evaluation and auditing process was discussed, this section also provided two diagrams which indicate how suppliers are classified into three main categories, and for the case of the new suppliers, they are also evaluated in this process. The following section will state the different types of information stored for each supplier.

#### 4.5.4.5 Information Stored on Suppliers

Case B, has a structured process in regards to their supplier sourcing, and supplier evaluation. To assist in the effectiveness and efficiency to conduct their business and their internal processes, Case B was encouraged to keep up-to-date and correct information about their suppliers. This information is also audited annually, when the supplier evaluation and auditing process is being conducted. The information stored creates a profile for each supplier, and this profile can be accessed by all necessary departments, including research and development, marketing, finance, and purchasing, also included would be the supplier's past evaluation ratings.

Additionally, each supplier's delivery time and prices for their raw materials are stored.

---

*"From marketing to logistics, that means from head to toe, we can all access the information from all sides".*

*"Each department can view the purchase order for each job they will all be able to view information from there".*

*"We record different prices over the years".*

*"We record delivery time over the years".*

---

This section highlighted the information stored on suppliers, and also showed that this information is accessible by each department in the company. Information such as delivery time and prices are also stored for monitoring purposes.

In the following section protocols and procedures will be discussed.

#### 4.5.4.6 Protocols and Procedures

Case B, adheres to the ISO protocols and procedures. One of which is the ISO 9001, the clause of purchasing. This clause covers the requirements to control purchased products, controls the suppliers you buy from and requirements to control Case B's buying process. These protocols look at managing quality, continuous improvement, education and training, occupational health and safety, design and development support, quality planning, customer documentation, procurement, incoming material, manufacturing quality, process control, nonconforming material, monitoring and measurement, maintenance, environment, and storage and packing.

The interviewee highlights below:

---

*We have follow ISO 9001, it's really there actually its only for the evaluation, yeah people are looking for this thing. Evaluation on the book is more on documentation, because of the ISO procedures. They have to see that.*

---

In this section, Case B identified itself as a ISO 9001 certified company and the different criteria was stated. In the following section the supplier selection problems will be discussed.

#### 4.5.4.7 Supplier Selection Problems

In this section, different supplier selection issues/ problems will be highlighted from the interview with the interviewee from Case B.

##### Inaccurate information

The interviewee highlighted that one of the problems in supplier selection is inaccurate information. Although their approved supplier list is mostly local suppliers, in some cases, they would to contact an international supplier to provide them with raw materials. In many cases, the interviewee explains that the information given about the company, their products and their locations are incorrect. In fact, for this reason, was another reason the decision was made to mostly source suppliers in Malaysia. The interviewee explains, if there is doubt about a certain supplier, it would be easier to perform a site visit to authenticate the supplier. The interviewee states below:

---

*"Yeah. A lot of the time they say they have such specification but they are not fully qualified. Sometimes the information on the internet is not correct and we would not be able to perform a site visit as they are international"*

*"That's why we more prefer to use a local supplier is because of our products and our work is based on projects or sometimes is special custom made. That's why we have to have a direct discussion rather than go to conference call or to email and all this is clearer. Otherwise we have to spend some time to get their sample, to coming in, don't leave from there, we'll have an outcome or what"*

---

Inaccurate information also has an effect on time for Case B, which presents another problem.

### Delivery Time

As previously explained, Case B is a project-based company with time deadlines to produce their products.

If the data is incorrect, more time will be spent on either replacing a supplier, or fixing the mistakes as a result of incorrect information. The interviewee states below:

> *"Then we will, from there we have to spend more time for the discussion and all this because every time maybe we'll have some conference call or through email and all this sampling and all this".*

### No Technical Ability Support

Another important problem raised by the interviewee is a lack of technical ability. The interviewee explains that for each job, a team assembles to discuss the requirement for the product to be manufactured. This team will include, the supplier of the material, the research and development team and the procurement team. The interviewee highlights that in some cases, there is a lack of technical knowledge with the supplier, as explained below:

> *"Yeah. Because sometimes the R&D maybe what they are designing out is more ideal but practically maybe for engineering, they will give some input and give them some output then we'll say that maybe there is not that balance for practical use, it's not that suitable. Yeah, that's why there is some, most say that conflict is more from discussion and understanding certain things".*

## Location

Another issue discussed with the interviewee was the problem of location. In some cases, some materials cannot be sourced in Malaysia, leaving Case B no choice but to purchase internationally. In light of this, the interviewee gives an example of the problems/ issues that can arise from international purchases:

---

*There are no recalls in it if there is a problem with the product. We can not buy from China when we require small-small things which is low value, maybe try small orders if they allow us. Sometimes we will have to make big orders just to get the little amount of material that we need. We can not return the product if it is defective, as it takes up a lot of time and money even it is possible. here when you buy from a local supplier, we can always say that this is defective and…You exchange it.*

*Or pay money, whatever. But it's a free value. Buying from China, you've got a lot of taxes, you've got lots of money and that's the end of that. So this is about the problem where the volumes are small amounts and these have a peculiar path. Sometimes they require handlers, some clients, they want specific handles, they require from China. But these are always small numbers and even small numbers you find that they far exceed the criteria requirement and then we end up every year and it stalls for years. So a lot of times today we are project driven. You'll find that customers can actually specify what furniture's or what parts or handles they have and this way you have a problem because we are project based and we are not serving you like retail or consumer product where we just want it as it is.*

---

## Volume of Stock

In the previous section, the problem of location was discussed, also another issue was raised, where in some instances, for an order to be made, small quantities are not allowed, and larger orders need to be placed. For Case B, this also presents another problem the volume of stock.

The interviewee explains:

*We need to be very conscious about buying materials because you'll find that, you'll be stuck with it. Because they'll always be there meaningful always like this whatever you buy. I would have to restrict customers on things like colours of items because I would have to purchase a large quantity of material and be left with the remaining stock for a long time, I say no, because if I buy this, I'll buy x number of bags, and then what will I do unless you pay me the difference and in most case the customers will not pay the difference.*

This section highlighted the issues or problems that exists with supplier selection in case B. The following section will discuss a theme that emerged from data analysis.

#### 4.5.4.8 Malaysian Culture Influence

Previously in this chapter, an evidence map for the supplier selection dimension presenting the main findings for this section. In addition, a theme emerged from the data analysis, which indicates that the Malaysian culture influences the supplier selection decision-making process.

For Case B, there is preference to use only local suppliers, for location reasons but for developing business relationships with Malaysian suppliers. The interviewee states:

*I think, in Malaysian culture, current culture, actually is quite useful. I can see that. You do not have to check their credibility.*

In addition to this the interviewee states that most business is conducted with friends of the family or friends of friends. The interviewee states:

*"Sure. Most businesses are conducted by friend of family, friend of friend".*

To conclude, this section has presented the findings from the supplier selection dimension for Case B. This section discussed, the company background, the supplier selection process, how are suppliers located or sourced, the supplier selection criteria, who makes the decisions, the supplier evaluation and audit process, the information stored on suppliers, the protocols and procedures used, the supplier selection problems and lastly the emerging theme highlighting the impact of Malaysian culture on the supplier selection process. In the following section, the presence of information technology tools and technologies in Case B will be discussed.

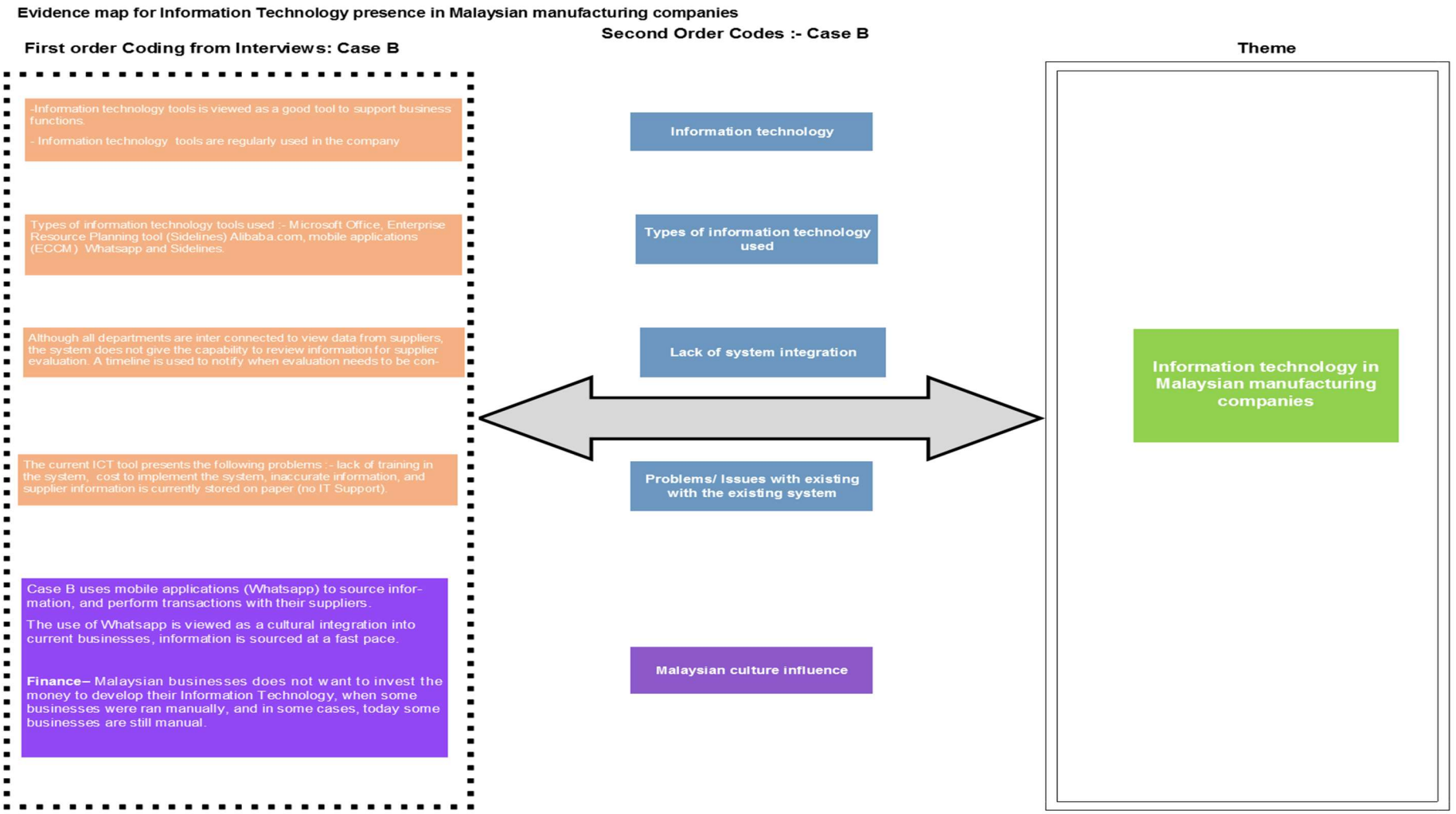



*Figure 4.14 The above evidence map derives from empirical data , and represents the information technology tools for Case B*

### 4.5.5 Information Technology in Malaysian Manufacturing Companies for Case B

The above evidence map represents the findings for “information technology in Malaysian manufacturing companies” for Case B.

The following section will discuss findings including information technology, types of information technology tools, system integration or lack of system integration, problems with the existing system and the emerging theme the influence of Malaysian culture.

#### 4.5.5.1 Information Technology

The information technology presence in Case B is highlighted as a good tool to support business functions and the tools is regularly used to support business functions of Case B.

The interview states below:

> *“Quite useful, I mean, regularly we use IT in all areas of the company”.*

For case B, the use of information technology tools provides an avenue, for their departments to be integrated and to allow access to information for the use of each department.

> *“We are using for 4 divisions. All divisions, from the purchase, from the customer, all this. All the information actually is inside.*
>
> *It is like all the modules like finance, purchasing, inventory, Logistic, inventory, warehouse, marketing, Production, marketing, all departments are integrated”.*

In this section of the chapter, states the relevance of information technology tools to Case B. In the following section the types of information technology tools used by Case B will be discussed.

#### 4.5.5.2 Types of Information Technology Tools Used by Case B

Following from the above section, this section will discuss the information technology tools used by Case B. The interviewee identifies a range of tools including mobile communication applications, to mobile applications.

Whatsapp

Whatsapp is classed as a mobile communication technology that allows users to send messages, documents, images, videos, user location and audio messages through a mobile phone.

The interviewee identified this tool as one that is regularly used to conduct the day-to-day business in Case B.

The benefits of this technology for Case B, is that it allows the transfer or exchange of information to be done at a fast pace, especially when the responsible person is remote or unable to access their emails.

Moreover, the interviewee highlights another advantage as an organisation, as mentioned earlier in this chapter (Company background), Case B is a project based company with a multitude of suppliers. For customer service reasons, Whatsapp prevents information from getting lost and allows for a quick response rate from those responsible from Case B.

The interviewee explains below:

---

*"Like sometimes with buyers and suppliers and all these and they will send the things from there. Also actually, it's fast. It's fast. Especially when outside, and you have no time to open the laptop and send the E-mail for. Of course all this we still though get into the Purchase order when we are back to the office, but hold up when you are out. WhatsApp.*

*Because we are not dealing with one supplier. Maybe one day they are plenty. Someday they are calling or what then we have to see the documentation we have copied. Then maybe from WhatsApp there, send a photo for the product itself to have a better view for understanding before you go back to the office. Then you don't waste time. You just different. I think, in Malaysian culture, current culture, actually is quite useful. I can see that. It's not only for how much you check".*

---

In addition to the use of Whatsapp, the interviewee discusses information technology tools that are used to support their day to day business functions, including Microsoft Office (MS Word and MS Excel).

In a previous section (Supplier evaluation), the evaluation process of suppliers was discussed, the interviewee states that MS Word and MS Excel is used to support the evaluation process for their suppliers.

*"Each one month and from there we can see the, how's there performance and all this is because the firm is not just rating by purchasers. Of course, to ours this, QC, QAQC, because from there we'll know like the yearly, based on what we selected, to a certain purchase order from there. From the time of purchase, how they perform from there.*

*We compile everything then only we put into Microsoft and generate the total".*

Alibaba.com

Another information technology tool used by Case A, is Alibaba.com.

Alibaba is a well-known global marketplace, which acts as an online supplier sourcing tool, allowing suppliers including Case B.

Previously mentioned in section 5.5.2, the interviewee states that Alibaba is used to locate and source suppliers. This tool allows for the procurement team to view reviews made by other purchasers. The interviewee explains below:

*"We also look into the internet to source from there, those from alibaba, a lot from there"*

The following image, shows the features provided by Alibaba.com.

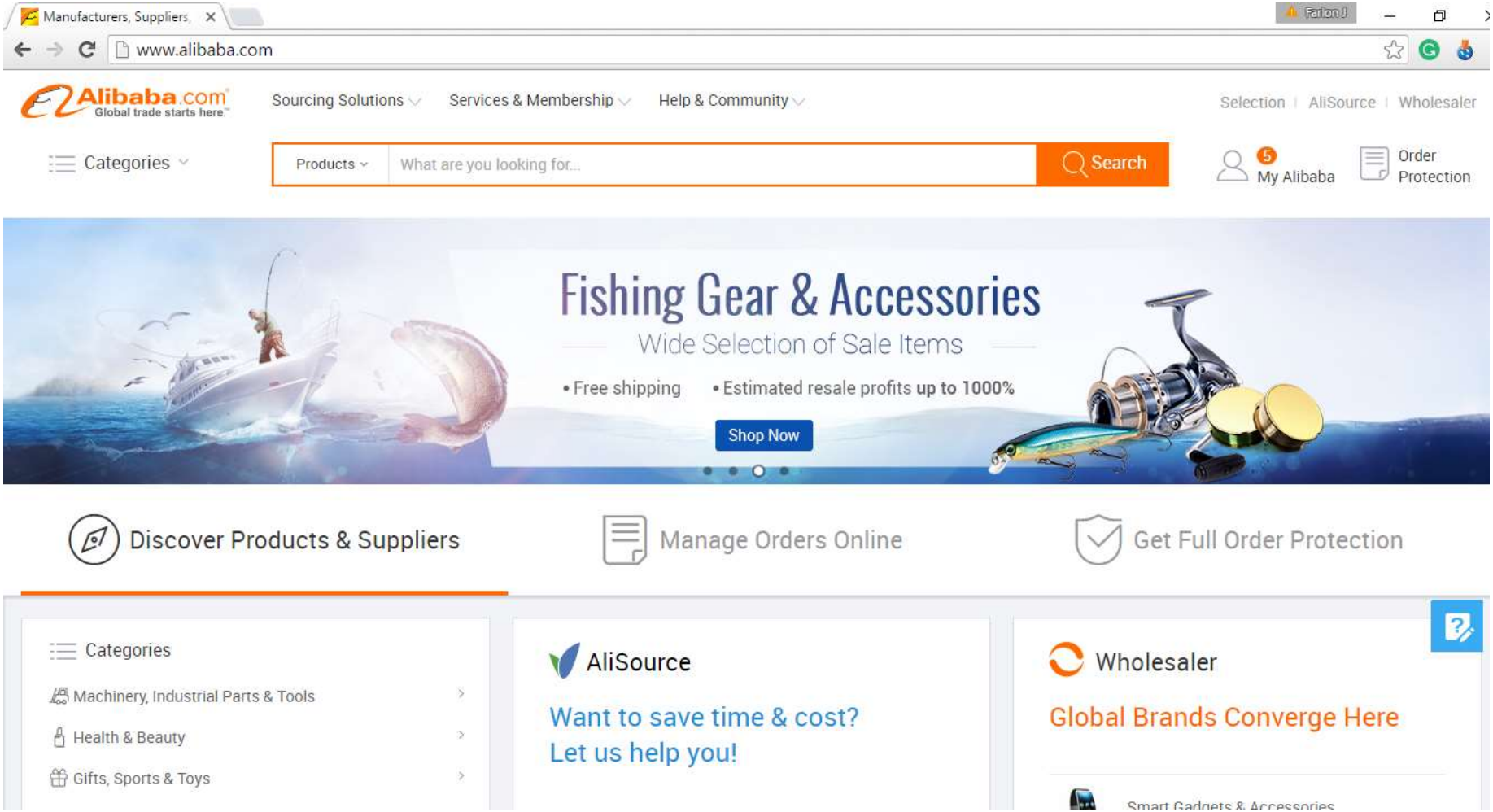



*Figure 4.15 Shows the interface for Alibaba.com*

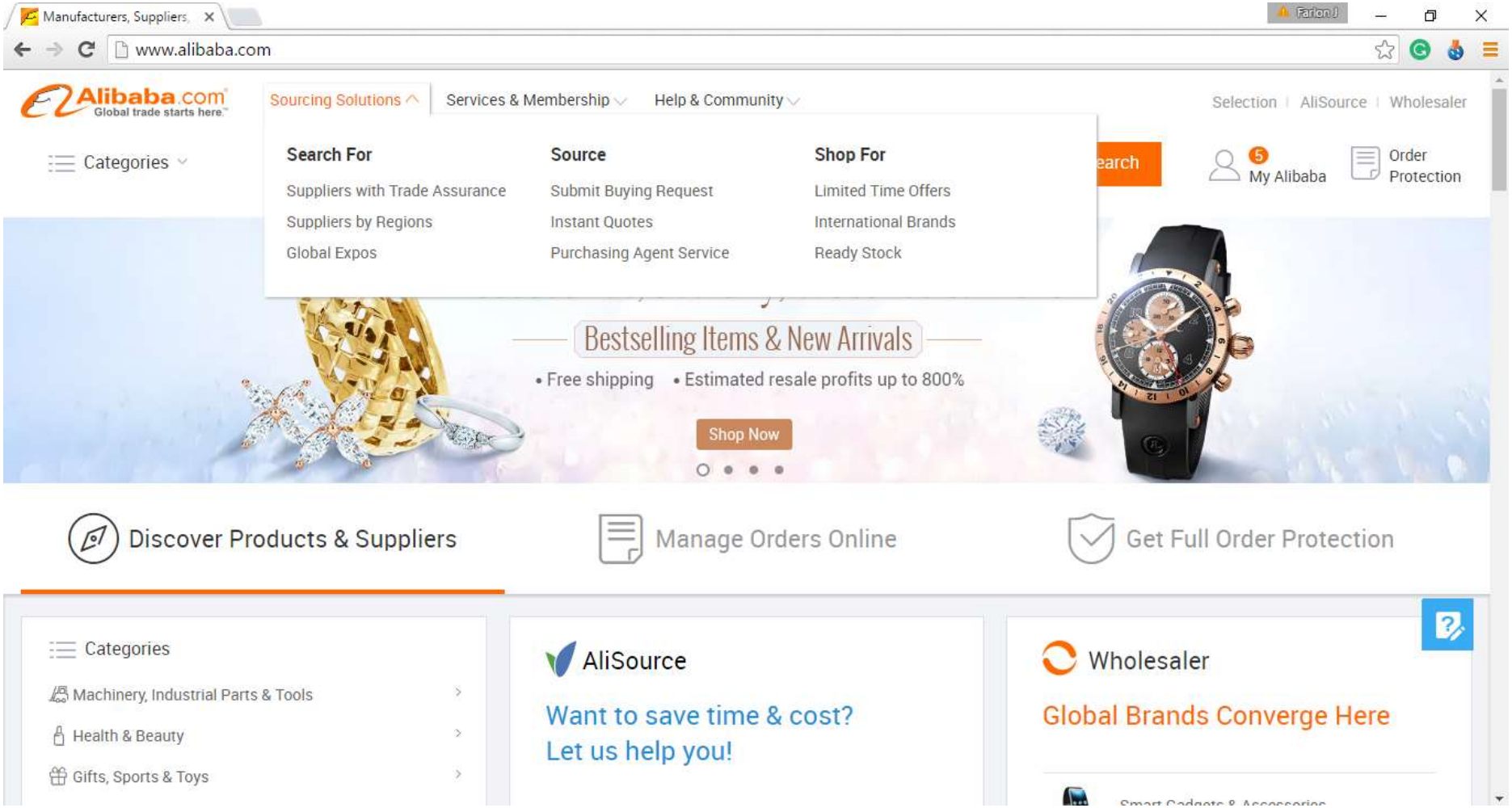



*Figure 4.16 shows the interface for Alibaba*

In this section, the different information technology used by Case B is highlighted and supported by interviewee quotes. In the following section of this case study, lack of system integration will be highlighted.

### Lack of System Integration

This section will highlight on the information technology integration amongst departments in Case B.

Currently, the information technology existing in Case B is supported by the Microsoft Office package. However, there is a lack of information technology support which allows transferability throughout departments. This has been identified as an issue by the interviewee, and new systems are being explored for implementation.

In the following section the problems or issues experienced with the current system will be discussed.

#### 4.5.5.3 Problems and Issues with the Current System

In this section, the interviewee highlights some problems existing with the current system, and also reasons for the delay of the new system to be implemented.

### Training

The interviewee discussed that there is a need for the support of information technology, and currently the support of Microsoft Office is being used to support their business functions. Currently a database, created by Microsoft Excel is being used to store details of suppliers. Currently an enterprise resource planning system, is in the process of implementation. The interviewee highlights training as one of the main challenges that will be encountered.

*"Interviewer:- In the implementation of side lines, are the users having any difficulties in using the program?*

*Interviewee:- So far they are. A lack of training. Training is not provided by the manufacturer, so we have to try to understand the program on our own".*

### Inaccurate Information

Another problem discussed by the interviewee is the implications of inaccurate information. For this case, inaccurate information refers to incorrect information inputted into the system. This can refer to supplier evaluation results, or cost of a product, as a result of human error. The interviewee also highlights the aspect of time, when discussing this point, as time will be taken to search for the accurate information to correct the system. The interviewee explains below:

*Interviewee: Yes, definitely.*

*Interviewee: - Even sometimes we have to trace back the old files, I mean the older times, and all these things and sometimes also we spend time searching. Sometimes different person maybe, their handling is different. Interviewee: - Misfiling. Yeah, misfiling human errors and all this. Definitely they will happen.*

In this section different problems with the current system are highlighted by the interviewee. In the following section the emerging theme will be highlighted.

#### 4.5.5.4 Malaysian Culture

Upon discussion with the interviewee, the Malaysian culture in manufacturing emerged as an impacting factor the use and presence of information technology tools. Case B, uses mobile communication applications to support their business; Whatsapp is highlighted as the tool used by Case B, and this tools are being used to allow for transactions to be conducted at a faster pace. The interviewee explains:

---

*And even though now for Malaysia are we, actually even WhatsApp also one of the tools.*

*Like sometimes we'll buyers and suppliers and all these and they will send the things from there. Also actually, it's fast. It's fast. Especially when outside, and you have no time to open the laptop and send the E-mail for. Of course all this we still though get into the Purchase order when we are back to the office, but hold up when you are out. WhatsApp.*

---

Whatsapp has become a popular tool in Malaysia, as this this is a free service. The interviewee highlights another factor that Malaysian culture impacts on, finance.

##### Finance

Although the implementation of information technology tools is known and viewed as an important tool to support business functions, the decision to implement such system is dissuaded due to the cost of purchase, implementation and maintenance of a system. The interviewee explains that some businesses such as Case B, is managed by the analysis of their accountant, and thus the managerial decisions. In some manufacturing businesses, the advantages are not seen to be beneficial, as their current system, which

in some cases are still manual (paper based) still works for them, so there is no need for the integration of information technology.

The interviewee explains:

> *They don't want to spend the money on such software. Because everything is determined by the accountant who is always very close to the boss. So everything they buy will be finance or accounting based and this is what happens in most countries like Malaysia.*
>
> *Generally I think it, will be the same in some other industries like construction in Malaysia. Because the finance director is very close to the owner and he gets what he wants basically and when, say procurement wants to purchase something overseas, they will say there is no need, the system works good. So this is what happens you find that, everything is financed here, even inventory systems, they are purchased always. Because, finance they say that there is some tired stock there that's why they want it. So everything is there, driven by finance. As always the case. And a lot of the times, this system is useless to users like us because they only serve their purpose to record. Yeah.*

This section concludes the Information technology presence in Case B. This section highlights the tools and technologies used to support supplier selection and business functions, the problems and issues encountered by Case B, and the emerging theme of the impact of Malaysian culture on information technology. In the following section of this case study, the presence of business intelligence tools and technologies in Case B will be discussed.

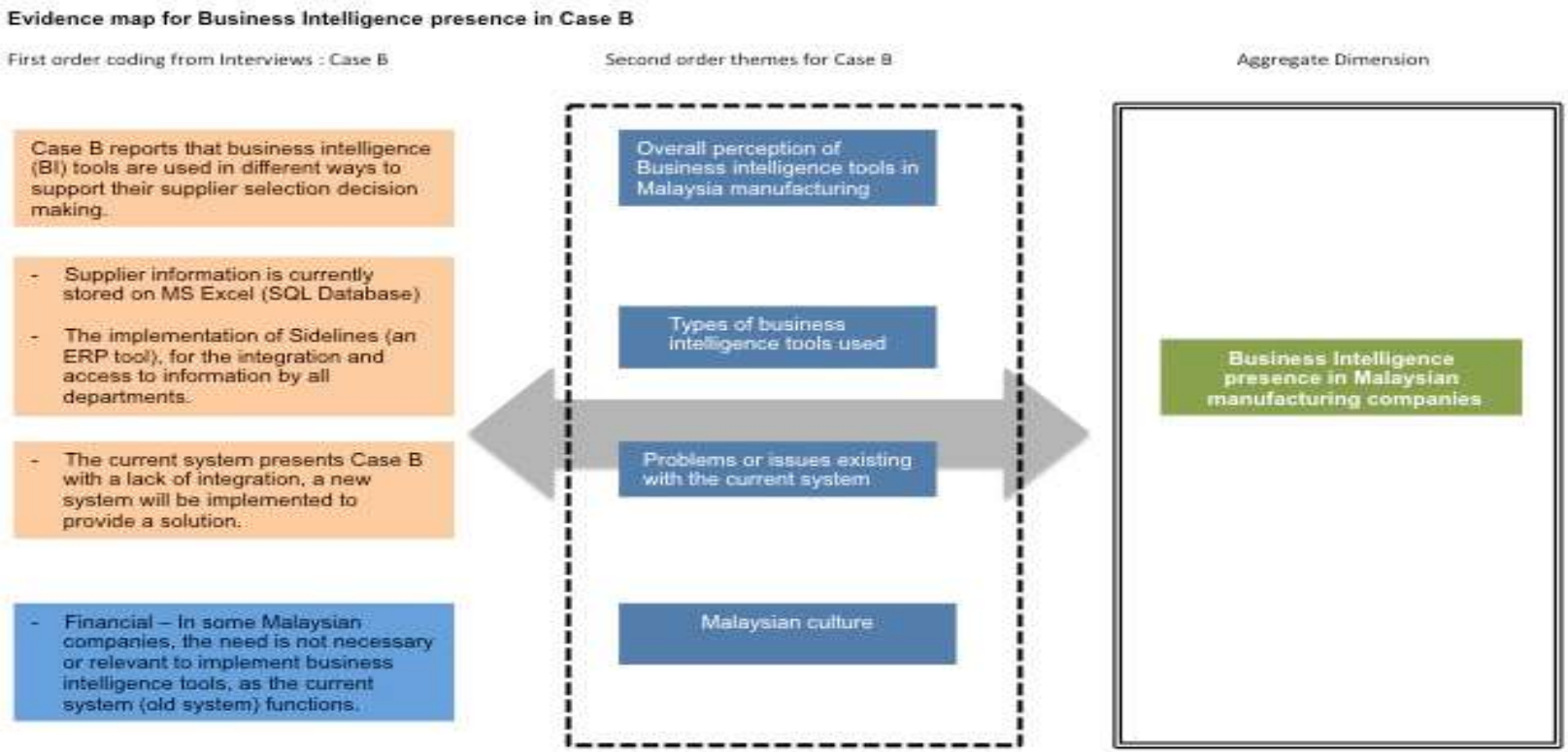



*Figure 4.17 The above figure shows the evidence map for Case B*

### 4.5.6 Business Intelligence Presence in Malaysian Manufacturing Companies

The above evidence map presents the main findings of the presence of Business Intelligence tools in Case B. This section will highlight the overall perception of business intelligence tools for case B, the types of business intelligence tools used, problems or issues with the current systems and will highlight the emerging theme of the influence of Malaysian culture on the implementation of Business Intelligence tools.

The following section will discuss the overall perception of Business Intelligence tools in Malaysian manufacturing.

#### 4.5.6.1 Overall Perception of Business Intelligence Tools in Case B

Business intelligence tools are used to support the supplier selection decision making process for Case B. The interviewee explains that the benefits of the presence of business intelligence tools would assist greatly for record keeping. As previously mentioned in the company background (Section 5.5.3) of this chapter, the supplier list of Case B consists of a vast number of suppliers and the presence of business intelligence tools allows for the access of data. The interviewee explains that currently access to some of the data on suppliers are still conducted manually, and cross referencing information with past projects is a long and sometimes unsuccessful.

The interviewee explains:

> *"Currently we are locating past job files manually, when we need to do, we call up a particular project or a particular product and then you, you can recall what's the supplier. As a veteran I know what I am looking for, but the younger ones they will not".*

This section presents the findings for the overall perception of the presence and usage of business intelligence tools and technologies in Case B. In the following section, the types of business intelligence tools currently being used and future implementation of business intelligence tools for case b will be discussed.

#### 4.5.6.2 Types of Business Intelligence Tools Used by Case B

##### Microsoft Office (MS Excel, SQL Database)

Currently, some of the processes including past job files for Case B's clients are still being kept manually. However, there are some processes, including the supplier information, supplier evaluation results are supported by business intelligence tools. These information is being supported and stored by the use of an SQL database, a tool of Microsoft Excel.

The interviewee explains:

---

*"Yes, yes, yes. So that is for our individual departments, we do our data or work, we still will use EXCEL.*

*We use SQL Database"*

---

##### Sidelines

As previously, explained in the problems and issues with information technology (section 5.5.5.3), the interviewee explains there is a lack of integration between departments, in regards to the access to information. In light of this, Case B is embarking on the

implementation of an enterprise resource planning system (ERP), called Sidelines. The interviewee highlights that this program is based in America, and is windows based, and this program will integrate most of the relevant departments responsible for supplier selection, and the execution of their business. The interviewee explains further:

---

*Quote 1:*

*"Side lines.*

*It's an American thing and is Windows based.*

*So we are going to use this".*

---

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*Quote 2:*

*"Yes, we generate the purchase order of course. All the, like, marketing they all also can do the, they can check the information from there as well.*

*Yes. From marketing to logistics, that means from head to toe, we can all complete inside, the information inside".*

---

This section highlights the types of business intelligence tools used by Case B. The following section will highlight the problems and issues existing with the current system.

#### 4.5.6.3 Problems or Issues Existing With the Current System

In this section of the problems or issues existing with the current system will be discussed. The interviewee highlights the main problem with the current system is a lack of departmental integration with accessing data.

Currently, each individual department produces a database with information that is most relevant to them. Also, as mentioned by the interviewee, the past job files for customers is still paper based. These factors contribute to and creates many problems and issues for case B including incorrect data, data replication, and a lack of efficiency and effectiveness. This information is also important to conducting supplier evaluation and can result in an incorrect result for the supplier.

The interviewee highlights:

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*"The suppliers are stored manually, so by paper. That's a lot of paper*

*Using a business intelligence tool will help, it will be a more environmental friendly less paper is more backed up.*

*. Easier for searching".*

*"You can scroll through your history with the supplier so easily, instead of now you have to dig up for hours 1 to 10, you know, and you have to look in every corner in order. You have to flip though"…*

---

*Quote 2:*

*Okay, the ERP system actually will let us join 4 divisions. All divisions, from the purchase, from the customer, all this. All the information actually is inside.*

*Hmmm.*

*It is like all the modules like finance, purchasing, inventory, Logistic, inventory, warehouse, marketing, Production, marketing, all departments are to be integrated. So of course we have just look out.*

*We will build up a database.*

*Yeah, it's really there actually its only for the evaluation, yeah people are looking for this thing. Evaluation on the book is more on documentation, because of the ISO procedures.*

This section presents the findings for Case B relating to the problems /or issues existing with their current system. In the following section, the emerging theme will be discussed.

#### 4.5.6.4 Malaysian Culture

The findings presented in this section of the case study will raise the influence of Malaysian culture on the presence of business intelligence tools for Case B.

The interviewee states finance is a major influence on the implementation of a business intelligence tools; in some cases, the decisions for change including the implementation and usage of business intelligence tools are reliant on the person or persons who is

responsible for managing the finances of the company. In these cases, business intelligence tools do not appear to be a feasible option as it appears that the current system or (old system) works and has worked, due to the family and friend relationship existing with suppliers. The interviewee explains:

---

*"So basically everything is driven from finance. So they don't want purchasing, they just record all the transactions they will make. So a lot of companies they won't go through for the best thing.*

*"They don't want to spend the money. They do not see the point if the current system works"*

*"Yeah, on such software. Because everything is determined by the accountant who is always very close to the boss. So everything they buy will be finance or accounting based and this is what happens in most countries like Malaysia"*

*"Most businesses are conducted by friend of family, friend of friend".*

---

This section highlights the main findings for the emerging theme; the influence of Malaysian culture on the presence of business intelligence tools in Case B. The following section will discuss the presence of artificial intelligence in Case B.

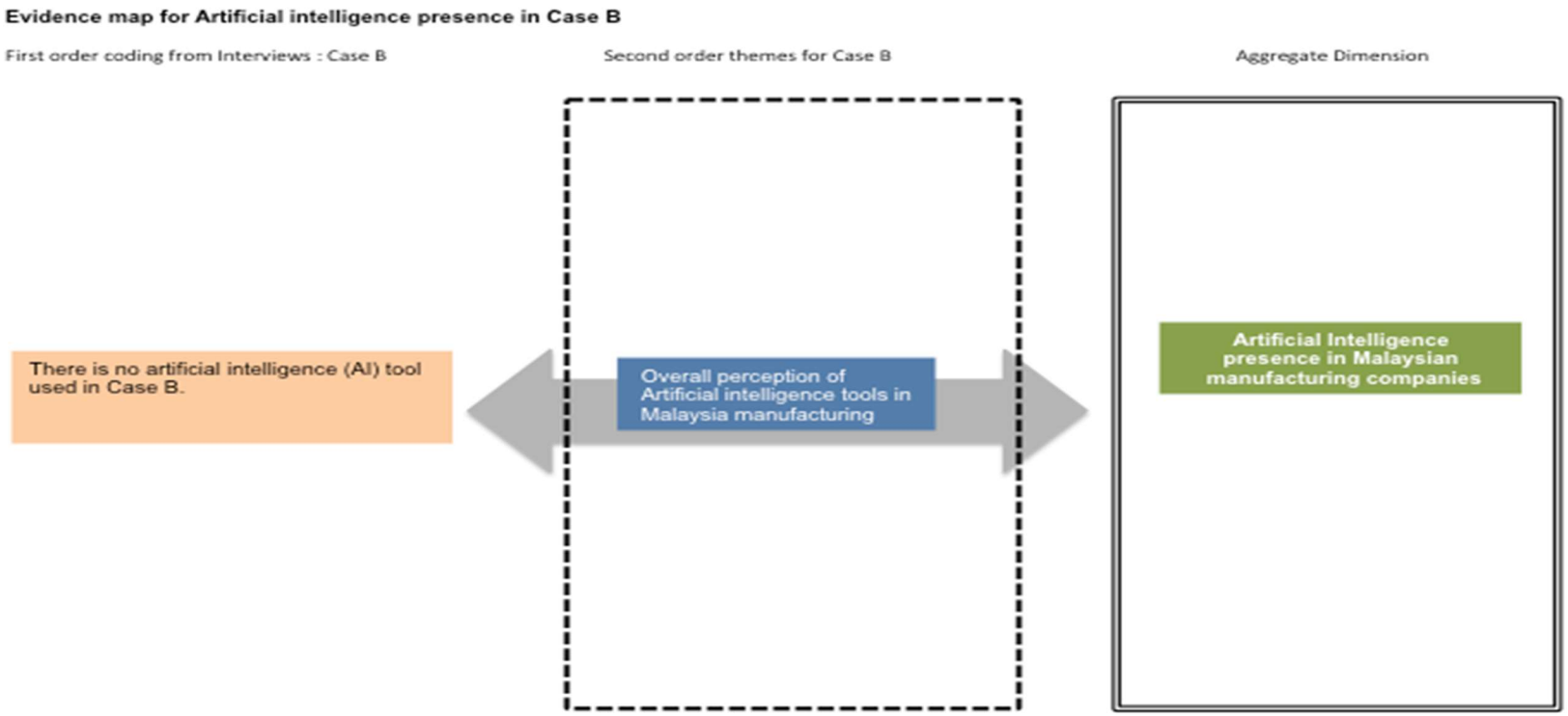


*Figure 4.18 – The above figure shows the evidence map for the Artificial Intelligence presence in Case B*

### 4.5.7 Artificial Intelligence Tools and Technologies Presence in Case B

The above evidence map presents the main finding for the artificial intelligence (AI) tools and technologies presence in Case B.

#### 4.5.7.1 Overall Perception of Artificial Intelligence Tools in Case B

As shown, there is no presence of AI tools used in case B. The interviewee did not share any perspectives on AI tools or technologies, as the interviewee did not feel AI was relevant to their business.

#### 4.5.7.2 Conclusion

This case study represents the findings for Case Study B, represented both by evidence maps for supplier selection, the presence of information technology tools, the presence of business intelligence tools and the presence of artificial intelligence tools. The main findings discussed the influences of Malaysian culture, highlighting finance and the preference to maintaining supplier relationships with family and friends, ensuring trust.

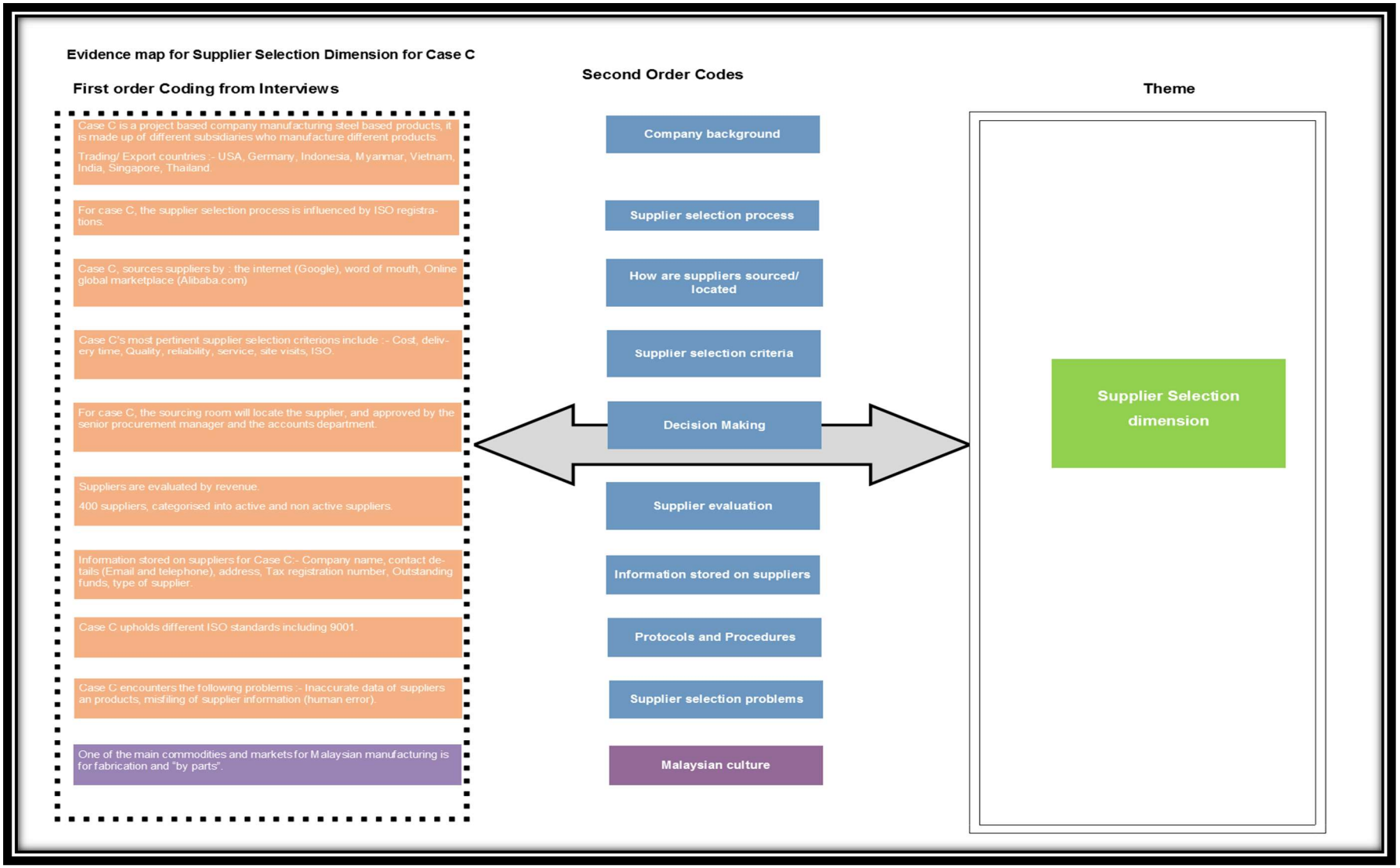


*Figure 4.19– The above figure shows the evidence map for the Supplier selection decision making process for Case C*

## 4.6 Case Study C

### 4.6.1 Introduction

For the purpose of stating the findings for Case C, the main findings will be displayed using evidence maps. The above evidence map highlights the main findings for the supplier selection dimension for Case Study C. In this section, the following areas will be showcased: company background, supplier selection process, how suppliers are located/ sourced, who the decision makers are, supplier evaluation, information stored on suppliers, protocols and procedures, supplier selection problems or issues and the emerging theme - the Malaysian culture.

The first section sub section will discuss the company background of Case C.

### 4.6.2 Company Background

Case C is a manufacturing company that produces steel-based products and operates on a project basis. Case C, consists of subsidiaries, who manufacture different types of products. Their product range extends to commercial kitchen appliances, transport, mobile kiosks and oil and gas steel-based products. Case C trades with the following countries: United States of America (USA), Germany, Indonesia, Myanmar, Vietnam, India, Singapore and Thailand. The interviewee explains below:

---

*"We have a few subsidiaries. So this is the main headquarters where we are doing a whole range of products, supporting to manufacture frameworks, coverings and also anything custom made requirement from customers. If you do sketch, you can convert it into a design by autocat and you can fabricate from that. Just name it, we can do it.*

*So this is MSM metal industries. And in the other factory across the street, they fabricate for oil and gas. Specialized for oil and gas and we have one more division where we are doing refrigerator, commercial refrigerators, and also kitchen equipment for burning like steamer, power steamer and cold steamer and all the export and also local usage. And we have another two more outlets.. We are doing some trading products and also custom made fabrications for franchise outlets like Alto, we have Zero tube oil and seven level. So we are moving not only for the hawker stalls we are moving towards to the franchise restaurants.*

*Interviewee: - Right now we are also doing the mobile kiosks".*

*"So we have another two automations company, One is more focused on combat system and the other it is more on semi-tall industrial machines. So they are doing for semi-choice vendor like Apple, like Western Digital, CK. I mean for their productions automation machines".*

*Interviewee: - US, Germany, Indonesia, Myanmar, Vietnam. They have now started referring me to India. Singapore. Thailand, Indonesia.*

---

To conclude this section, the interviewee gives a brief description to the company background, describes the different subsidiaries and the types of products manufactured along with the companies to whom they trade with. In the following section, the supplier selection process will be discussed.

### 4.6.3 Supplier Selection Process

This section will highlight the main findings of the supplier selection process for Case C.

For Case C, the supplier selection for new suppliers requires these suppliers to be ISO certified.

The interviewee states:

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*"Supplier selection process. So this process must been registered under ISO. So this is the procedural details".*

---

The interviewee further explains the ISO supplier selection requirement and explains what ISO is:

**ISO – International Standard Organisation**

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*"For me, ISO is something w*hich we practice. We already have *established. Then we register as ISO practice."*

Interviewer*:- Okay. Is there any particular criteria that the ISO states that you need to have to run as an ISO practitioner?*

*Interviewee:- No. From what, in our practical things, what we practice here, whatever we do, we document it and then we do what's in the document. Like, people we say, do what you write, write what you do. So don't do extra all the time. So if you do extra then we need to give revise and revise for procedures. Then this is to be documented into ISO.*

---

Further to the explanation of the ISO requirement, the interviewee further explains the new supplier or vendor selection process.

For Case C, there is a structured process in the decision-making for new suppliers. The interviewee explains that their approved supplier list currently holds over 400 suppliers, this is due to the wide range of products they manufacture. The selection process begins with a standardised form the new supplier fills in, consisting of their company name, company address, contact details, their financial information and the materials they are able to supply to Case C. This information is then examined and approved by a few members of staff; when this information is verified, the supplier is then added to the approved supplier list.

The interviewee supports:

---

*"So, a new vendor, all right? There is no limit and no rules to always maintain with the existing suppliers. Okay, So currently any new supplier are a lot. Currently we already have almost about 400 suppliers plus. So we still carry on business with them. So this all initially of course we didn't have any procedure to do a selection I think so. So after we had established, so we start to register and ask the supply into the system. Right? So we have all the, a format bag they need to fill in. What is company, where is the address, who is the contact person, how much is their investment and what they are doing. So they'll fill in all these requirement and internally, we'll go through few members internally. Okay. Then we will select the supplier. If they are already in existing business but just for registration and then we will select them, we approve them, when we register into the system".*

---

In addition to the ISO registrations, the interviewee describes other criteria that is examined to select a new supplier.

#### 4.6.3.1 Supplier Selection Criteria

**Quality**

After each new supplier completes the new supplier selection form, certain aspects are looked upon for the supplier to be selected. Firstly, the quality of the product is assessed.

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*Criteria, first of all they have a good product which we are looking for.*

---

Next, availability of goods is assessed, so that materials or products can be supplied to Case C when required.

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*"Second thing, the availability of goods every time whenever we require".*

---

These two criteria consist of Case C's supplier selection decision-making process.

The interviewee supports:

---

*"This is the first criteria because without trying them for continuous production we never know how will be the, their capability on delivery and quality. So this is just an initial process. So initial process, normally a big company, we will look always in the financial background because we will buy on their terms and also we will introduce a lot of process of buying. It's not just, purchasing is not, it's not only, you should be well when you buy well, introduce a lot of new process of buying. We have consignment sales. We have a blanket PO all this process. So in order for the*

*supplier to cope with our requirement, they need to strongly and financially. So if they are just small players, they cannot meet our requirement. They just do a small trading. Then whenever we do some, any buying we cancel, any buying we can push out, okay? So at this moment, they need to stay with us. This is very important. So we need to look at their financial background and all and the people who are serving them, serving us. So this all is important. So we'll look into this because we will do more discussion, then we will qualify them as a supplier".*

---

This section presents the supplier selection criteria for Case C, as the interviewee explains Case C's supplier selection decision-making process and identifies the main supplier selection criteria as being ISO registered, quality and delivery time. In the following section of this case, the methods in which suppliers are sourced or located will be discussed.

#### 4.6.3.2 How Suppliers are Located/ Sourced

In the previous section the main supplier selection criteria used for the supplier selection decision-making was highlighted. In this following section, the methods used by Case C to source or locate suppliers will be highlighted.

As earlier mentioned by the interviewee, Case C, has approximately 400 suppliers, who supplies the different branches of the company as stated in the Company background section of this case study. The interviewee states that for Case C, their management prefers to have different suppliers that can supply them with the same material, for the reasons of pricing competition. The interviewee explains below:

*"Managements like to have more suppliers because there would be more competition, so we can bargain here and there".*

The interviewee identifies how new suppliers are sourced by commodity. In this case commodity refers to the different branches of the company. The interviewee explains further:

*"So first of all we will just try to understand commodity it falls under. Commodity-mechanical, electrical, electronic, so or some other custom made item. So from there, we will try to get, first choice will be the existing supplier. So if this existing supplier is unable to provide this information, we will go through of course the Google will be the searching tool. That's where".*

### Google

The interviewee identifies Google.com as a commendable source to search, and locate suppliers. The interviewee compares the traditional yellow pages to the Google search engine, and states that Google is more advanced, faster and there is no limit to information that can be accessed as compared to the traditional yellow pages. The interviewee states:

"Main is Google. Because from our experience, Google is good enough to be, and then of course we have, we call these as yellow pages but Google is more advanced than that. More faster and Google globally, not limited to, okay? So yellow pages is only for local. So Google globally. Either we can go for overseas sourcing or we can limit to relation supplier only. So if we are not able to get even on Google, there

are a lot of things. So we will ask okay, like a Xerox was experience of doing this before. So we will ask them, I already found, I am unable to find source of information".

---

In addition to general google searches, Alibaba.com is also stated by the interviewee as a method or tool used to source or locate suppliers for Case C. The interviewee states that Alibaba.com, is used as an information guide, and the supplier is contacted directly, this is to ensure accurate information and specification on the product being purchased. The interviewee explains below:

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*"I always go to Alibaba and then take the reference, who is the supplier and then go direct."*

---

In this section, the tools used to support the location or sourcing of suppliers was highlighted. In the following section, the supplier selection criteria will be discussed in further detail.

#### 4.6.3.3 Supplier Selection Criteria

Previously, the case study explains the type of business, the supplier selection process and the tools used to support the sourcing of suppliers. In the previous section, supplier selection process, the interviewee mentions delivery time, quality and access to materials as some of the main points used to assess the supplier when making a supplier selection decision. In this section of the case, these above-mentioned criteria

and others will be stated and discussed.

The interviewee states below:

---

*"Number one, of course, pricing. Second, not compromise, its not number two but not compromise its quality. Third is one time delivery.*

*Interviewee:- Delivery. So because pricing, because depends. Certain industries, they are looking for quality. Certain industry quality is number second. So for us its common items. We are buying steel. So steel is a common item. So who can give us good pricing. Of course quality is not compromised".*

---

The interviewee highlights delivery time, pricing and quality as the three most pertinent criteria used to assess a new supplier. Moreover, the statement indicates an inter-relationship between these three (3) criteria.

Where quality is indicated as being a criterion that is not compromised, delivery time and the pricing of material is negotiated. The interviewee goes on to highlight one of their main purchases as steel, where quality is never compromised, and a supplier that can offer a reasonable price is often sought after.

The interviewee explains further:

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*Some suppliers, they have the material but the cost is high. The other supplier, say I will get for this material but its not in stock. It's not in the hand but the price is cheaper. So at this moment, we'll have internal discussions with the sales team. So*

*this is the price we have lower. And these are price, the goods these have in their hand is high. So is its urgent? We need to deliver this out? Yeah, it's very urgent. We have to do so please take this with you. We'll always have a discussion.*

---

This section highlights the main criteria used by Case C to select suppliers for their decision-making process. Delivery time, quality and pricing/cost, are the most pertinent to Case C. The interviewee also highlights the inter-relationship between these three criteria, also giving an example of the flexibility of the inter-relationship, by assessing the demand of the material and the cost.

In the following section, the decision makers will be discussed.

#### 4.6.3.4 Decision-Making

The previous section focuses on the most pertinent criteria to Case C, for the decision-making of suppliers. This section will underline the decision-makers for Case C, and their role in the decision-making process.

Case C's decision making process is structured due to their company structure, as it consists of different subsidiaries, who manufactures different ranges of products. For this reason, a sourcing room exists to provide support for the different subsidiaries.

The sourcing room is responsible for locating or sourcing the suppliers to meet requirements (delivery time, quality, pricing), complete the required forms, and discuss with the supplier terms and conditions. After this process is complete, the process will extend to the finance department, for the final decision, and only the finance department has access to add this supplier to the approved supplier list. This is done to have more control over approved suppliers for the company. The interviewee explains below:

*"The sourcing room, we have a sourcing room. They will select. Not select, they will find a supplier, a new supplier whoever. They will fill in the forms and things, all that. I'll go through and have a discussion with the supplier. Then once I agreed, then a new system which I mentioned just now, even I cannot create a supplier. The account department, the finance department only can create a supplier in this system. So this is fully controlled. This control is good for the purchasing system because we have a lot of sensitive things, all right? So this is really a must, even if I can just clean the system then I can bring more of my friends to put in the system and then make them my supplier. So if the finance is control, then we need to go through all. Filling in the form is not simply to put in".*

In this section, the interviewee explains the decision-making process of Case C. It also highlights the main departments responsible and in addition, the interviewee states the level of control that is adhered to, ensuring that the approved supplier list is "clean".

#### 4.6.3.5 Supplier Evaluation/Audit

In this section, the supplier evaluation for existing suppliers will be discussed.

As previously mentioned in this case, there are approximately four hundred (400) existing on the approved supplier list. These suppliers supply products and services to the different branches or subsidiaries. As mentioned in the supplier selection process, most suppliers are submitted to the approved supply list once the main requirements are met. Due to this, there are active suppliers and non-active suppliers on the approved supplier list. The active suppliers are defined as those that are used on a constant basis; this can be on the grounds that the delivery time, quality and pricing or cost are meeting

the standards for the company. Non- active suppliers are those who have been used a few times, and there is a possibility there were problems or issues with delivery time, pricing or cost, and quality, or, these suppliers were added on to the supplier list as they supply a unique product that is only required as a one-off. An evaluation of the approved supplier list is conducted on a yearly basis, and this process is assessed according to the revenue that is spent by Case C on each supplier. The process starts by overviewing the purchase orders for each supplier, and applying a filter of ten thousand Malaysian Ringgit (10,000MYR) per annum, and any revenue under this cost is considered to be a "non-active" supplier. The active suppliers are then evaluated or audited by delivery time, pricing or cost, and quality. If the result of the audit is not favourable, these suppliers are then considered to be a "disqualified supplier". The following quotes supports:

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*"Current supplier's evaluation will be based on how much is the revenue which is given to them. Because we have 400 hundred suppliers. Out of this 400, not everyone is active. So we have active and non active suppliers. Then we run the system to see how much PO (purchase orders) we have for them. So, if above ten thousand, so this is called an active supplier? So, out of 400, the active supplier is only about maybe 100. So 100. With these 100, what is the criteria we can see how good, how is the pricing, second thing OTD (on time delivery), third is quality"*

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*On time delivery. So with new supplier or existing suppliers, I only, mostly and generally if we will talk, QCD and S. Quality, delivery, cost and service. You see. So*

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*any supplier who meets this pocket of criteria, they will stay with us for a. If either one is dropped, so its just a matter of time how you can sustain with us*

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*Reliability in…delivery is reliability. Okay? Delivery is important. Whenever, we didn't have a very tight control of delivery measurements in the system. Other industries, okay, now earlier ones, I was in different industries. Every month we would do measurements for one time delivery based on when did the PO issued, when is the delivery time requested but what is the promised delivery and what is actual delivery. So we can do calculation, so we can see how, what is the rate. So, normally 80% or above is considered as median on time delivery. If we saw every time they are below 60, 50, 40 so these are the suppliers always looking for trouble. And before we disqualify them, we need to look into how important they are to us.*

*Okay. Sometimes we have limited suppliers for certain things. Only they can, only certain suppliers can do this thing. So they are one of them. And maybe they have the advantage of pricing also. So we cannot squeeze them much. So we always need to find touching to them, try to improve, we need to do a lot of discussions to motivate them. We cannot disqualify or throw them out.*

*So they are called as non-active suppliers. So what happens is not a big worry for customer. Right? Because we cannot, as I mentioned sometimes, while we are growing up, we cannot have too many suppliers.*

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*Interviewer- But what about ones that are inactive? Why are they still inactive?*

*Interviewee:- Okay. Because it probably, from how I am seeing it, you could look at, you could select them.*

*Interviewee:- That's the reason, I say its non-active. I didn't delete as a buyer. (both laugh) The system, okay, if we go use our old way of in exhale, normally if they are not active, our mind will just delete them. So with a new system, maybe I'll show you on the internet, you remind me. We'll just, non-active. So, but their name is still there. We didn't delete them. So, if we are not hyperactive now to just go for a new one, we will have a calm time to look into the suppliers who have previously, because every supplier we have their, we can say, commodity. What they are supplying for. So we can look into that.*

In this section the supplier evaluation or audit process of Case C, is highlighted as a process driven, where suppliers are monitored and evaluated on delivery, pricing, and cost. Delivery time extends to reliability, their on time delivery (OTD), is assessed. In some cases, Case C will be forgiving to some suppliers with a low rating, as these suppliers may be suppliers that provide a specific product or service difficult to source. In the following section the information on suppliers will be discussed.

#### 4.6.3.6 Information Stored on Suppliers

For Case C, there is a wide array of information that is collected and stored on their suppliers. As mentioned in the supplier selection section of this case (section 5.6.3), one of the main selection criteria is the ISO registrations for each supplier and their tax registration. Along with company name, company address, contact information, type of product supplied credit limit, the ISO registration would also be stored. The interviewee explains:

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*Information, what kind of information we need to put here at is supplier, a new supplier selection. So we will need to go through the ISO configuration, things and all. And once I signature, the accounting, finance will, put it there.*

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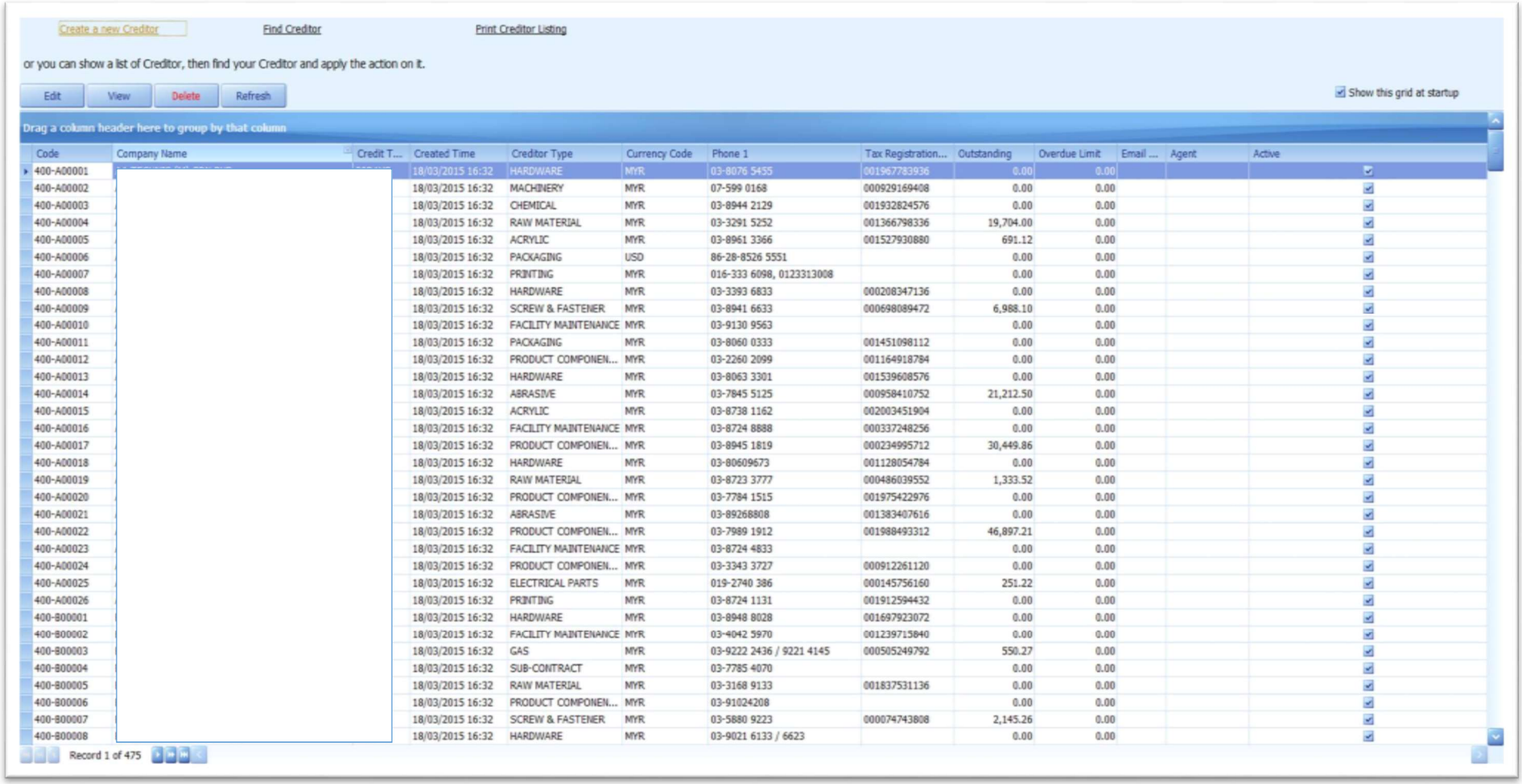


*Figure 4.19 1 Shows a print screen indicating some of the information stored on Case C's suppliers.*

The above section highlights the information stored on their suppliers by Case C. The following section will state the protocols and procedures used by Case C.

#### 4.6.3.7 Protocols and Procedures

Previously in the supplier selection section, ISO registration is stated to be a mandatory requirement for a supplier to be considered for Case C. In this section, ISO will be discussed.

The interviewee states:

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*"Okay. Supplier selection process. So this process must been registered under ISO. So this is the procedural details".*

*"Okay. For me, ISO is something which we practice. We already has established. Then we register as ISO practice".*

*"From what, in our practical things, what we practice here, whatever we do, we document it and then we do what's in the document. Like, people we say, do what you write, write what you do. So don't do extra all the time. So if you do extra then we need to give revise and revise for procedures. Then this is to be documented into ISO".*

---

As defined by the interviewee, International standard organisation (ISO), and the purpose of this is to give an international standard. For Case C, the following standard is adhered to, ISO 9000 (Quality Management).

ISO 9000 (Quality Management), addresses various aspects of quality management and provides guidance and tools for companies who want to ensure that their products and services consistently meet customer's requirements and that the quality is consistently improved.

For Case C, as previously mentioned, the interviewee states that quality is one of the main criterion that is assessed when selecting their supplier. Moreover, in the supplier evaluation or audit section (5.6.3.5), the interviewee states that one of the main criteria monitored and evaluated is quality. These factors are criteria that is connected to the ISO 9000 registration for Case C, where they are responsible for ensuring that the products and services consistently meet customer's requirements and that the quality is consistently improved.

This section highlights the ISO protocols and procedures that is adhered to by Case C.

#### 4.6.3.8 Problems and/or Issues with the Supplier Selection Decision-Making Process

This section will highlight the problems and/or issues uncovered by the interviewee existing in Case C, with the supplier selection decision making process.

The main problems include, quality and inaccurate data from the supplier or false suppliers.

##### Quality Problems

As previously mentioned, quality is one of most pertinent criterion that is considered for Case C. This criteriion is also monitored and evaluated as highlighted in the

supplier evaluation section (5.6.3.5). However, quality still remains a huge issue for Case C, especially in the case of new suppliers. Although, their main selection criterion is the ISO 9000 standard, the quality can only be assessed once a purchase of material is made. In some cases, a substandard product is received, but the pricing criterion is met. Although this situation will be resolved at the supplier evaluation phase, Case C, has already invested revenue to this substandard product. The interviewee also mentions the time factor, in some cases, a supplier will approach the company with a product, and in some cases it is a product that is difficult to source, the company will proceed with the purchase, and neglect to perform their necessary checks. However, in some cases, the supplier is false.

The interviewee supports:

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"Talking to new suppliers, for individual suppliers, pricing always will be a concern. Quality, we cannot determine yet, the service without trying, unable to predict. First. So quality and delivery will be a later part but unless we cannot find these goods with the suppliers, we have to find only them. So we'll try to get the information on the parts and that's no difficulties. Pricing".

---

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*"Yeah. Currently, delivery will be always, always a surcharge. Delivery. Quality, because our, we are buying a raw material. So the quality is, we have it. The quality also, here means that the weariness of the material, the appearance of*

*the material, so this is…but this is not to be critically a subject to discuss and immediately to reject. So quality and delivery, this is the main issue".*

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Another issue highlighted by the interviewee is inaccurate information or false suppliers. The interviewee explains this issue further:

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"Sometimes we will meet a trader only with a laptop, and they say that we can sell you these products, or, I can supply these and things so. So we go with it. We just believe their price, we just look at the quotations and things and all. And then after, after we can find some issues, quality problem, any problem, okay. Can I come to your factory? Then we can, then we will find out. They got no factory. *They are buying from someone else and selling to us.".*

*"Inaccurate. And the time that's framed, sometimes makers, okay it's too late for us to go and audit their factory. Just give me the quotation, all right, issue a PO, deliver the goods tomorrow".*

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*"So the time limitation will, will stop us to perform an audit. So, but whenever we have quality issues and things and all, then what happens, then we find out that needs an audit, needs an audit. He didn't produce that, he is just buying from someone else and selling".*

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In this section the main issues and or problems faced by Case C are discussed and highlighted. In the following section, the emerging theme of "Malaysian culture" will be discussed.

#### 4.6.3.9 Malaysian Culture (Emerging Theme)

This section will highlight the impact that the Malaysian culture plays on the supplier selection decision making for Case C.

The interviewee refers and highlights a few points:

##### Supplier Selection

The interviewee reveals that the Malaysian supply chain is limited, as there are only a few functions that can be performed in Malaysia. There is also a limitation to certain companies as they do not own the material to produce certain products that is required by some international companies. Some of the technologies are too advanced for Malaysia, and for some companies that can afford this, they will have to purchase new equipment so they can facilitate the needs of their supplier. The interviewee explains below:

---

*"Earlier I was in machine manufacturing industry. Machine manufacturing. Okay? So in machine manufacturing, we have electrical, electronic and mechanical parts. So electric and electronic, we will import directly from our, okay. So the machine was European made machines, so it was developed and introduced by a European from Netherlands. So they already have all their supply chains from Netherland itself. So they already transferred the technology to Malaysia. Only certain things we can do in Malaysia. That means, mechanical fabrication, you know the CNC fabrication, you've heard of the water machine. We'll buy solid steel and then we'll cut according to".*

*"So we can do that in Malaysia. That will be. So the commodity, the main commodity would be fabrication and by-parts. By-parts means electric and*

*electronics and fittings. So most of the by-parts, these, we buy from Europe, direct to the supplier."*

*"No. because we cannot get, because this all is custom made items. That means only a selected suppliers given a contract, given a R&D fund for them to develop these and give to the manufacturer of the machine. In Europe, they have done that. So why they started technology transfer to Malaysia, in order to go on ways this effort which dated many years ago. So we go and buy from them directly. Of course, buying from Europe is expensive. Expensive of causing term of currency selecting, regarding service charges and things. Come back to your question. So machining, yeah? So machining, we widely, of course, now if you just put on Google, you can see 100, 200, 300 suppliers in the list. But earlier, we have yellow pages and then network from people".*

---

In this section, the interviewee expresses one of the main issues with the Malaysian culture on supplier selection decision-making.

When supplying to international organisations, as most of the Malaysian manufacturers do, the fabrication requirements are higher and require new machinery to produce the products that are required by their supplier. In many cases, manufactures will need to invest in new machinery and in some cases new locations to facilitate these needs.

In conclusion to the supplier selection dimension of this case study, the following areas were explained and highlighted: the company background, the supplier selection process, how are suppliers were located or sourced, the main supplier selection criteria, the decision makers, the supplier evaluation or audit process, the information stored on suppliers, the problems and issues experienced in the supplier selection decision-making process and the emerging theme of the case. In

the following section, an evidence map will introduce the presence of information technology tools for Case C, and the second order themes will be discussed.

The below evidence map represents the key findings for the use and presence of information technology tools for Case C. This section of the case will highlight the overall perception of information technology, the types of information technology tools used by Case C and an emerging theme, which highlights the emerging theme of the influence of the Malaysian culture on information technology tools.

The first section will highlight the main findings for the overall perception of information technology tools for Case C.

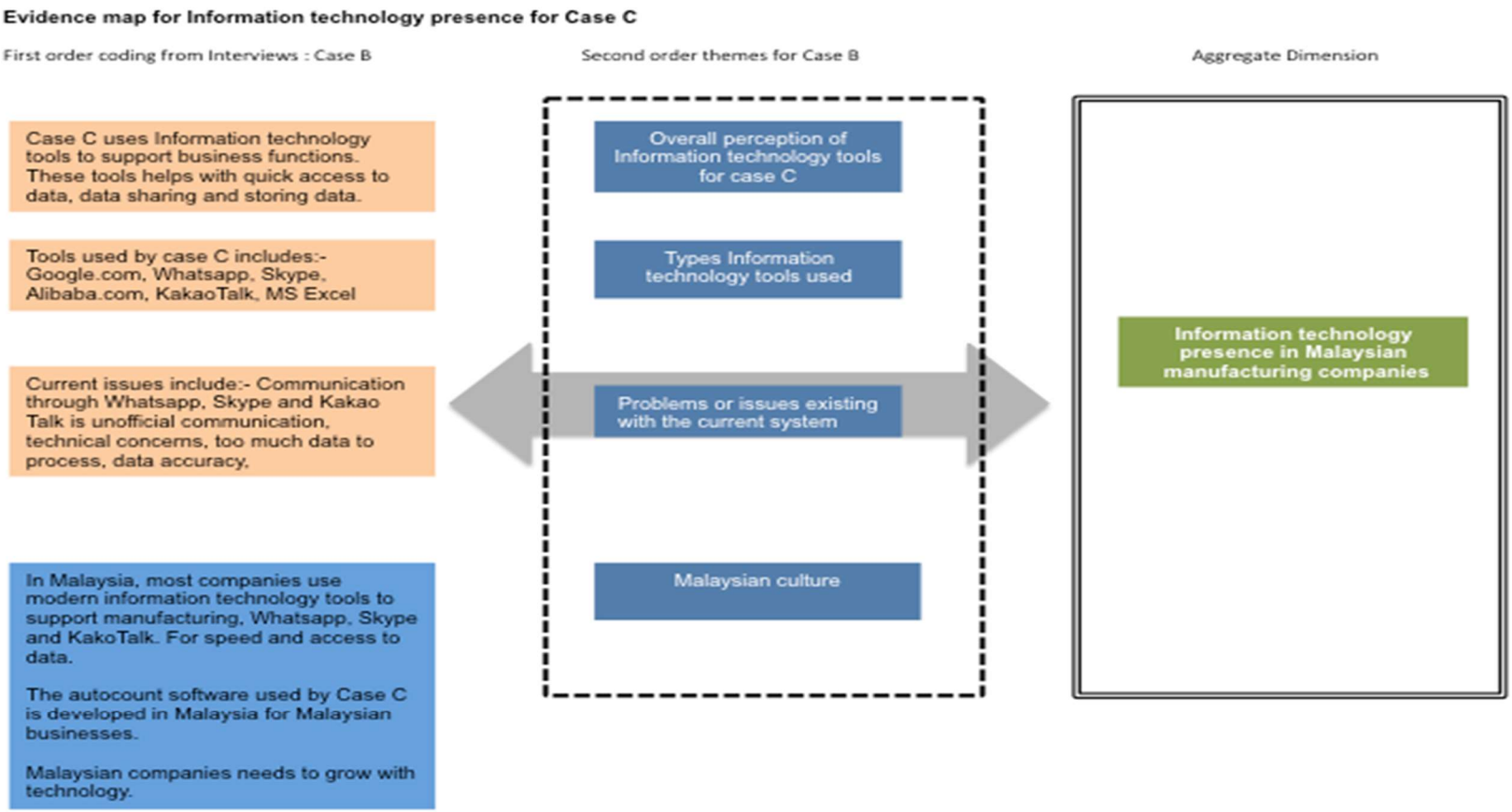


*Figure 4.20 - The above evidence map shows the information technology presence for Case C*

### 4.7.1 Information Technology Tools for Case C

#### 4.7.1.2 Overall Perception of Information Technology Tools for Case C

Earlier in this case, the company background stated that Case C produces a wide array of steel products and that their supplier selection is centralised to a sourcing room responsible for all purchases for every subsidiary. For this reason, Case C is completely supported by Information Technology tools. Case C, utilises information technology tools to unify and support their business needs. As they exist in a fast-paced and competitive manufacturing environment, their response to their customers must be accurate and quick. The use of Information Technology tools enables Case C to be efficient and effective.

The interviewee states speed is important to their business functions. The tools used to support this will be discussed in the following section. However, the interviewee supports below:

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*"Interviewee- do you think that it helps with your decision making? Like, use of information technology.*

*Interviewee: Yeah. Helps a lot. Speed.*

*Interviewee: Speed.*

*Interviewee: Speed.*

*Interviewee: Access to information."*

---

The following section will highlight and discuss the types of information technology used to support supplier selection, and supplier evaluation used in Case C.

#### 4.7.1.2 Types of Information Technology Tools Used

The above section highlights the overall perception of the use of Information Technology, and supports that it allows Case C to be efficient and effective in order to compete in a highly competitive market. This section will highlight the tools and their functions.

**Mobile Communication Tools**

***Whatsapp***

In this section, the cross platform mobile communication application WhatsApp will be discussed.

Whatsapp has been identified as one of the main information technology tools used to support Case C's day to day business, including supplier selection, and purchasing of goods and services. Whatsapp allows users to communicate on an interface supported by their mobile phones, where information including text, word documents, excel documents, photos and voice clips are instantly exchanged. Case C, uses this mobile communication tool to support their day-to-day business. However, one of the main disadvantages, as highlighted by the interviewer, is that Whatsapp is an informal method of communication, and there may be some data security issues, as the communications are not encrypted. The interviewee compares WhatsApp communications to E-Mail exchange, and states in most cases, a person's inbox is full and they can easily not see an important email, and with Whatsapp, you will have notifications, to let you know you

have a message. Another important point highlighted by the interviewee, is that most businesses in Malaysia conduct business transactions via these methods, and identifies that a minute percentage of businesses in Malaysia is not using Whatsapp; also other mobile communications are being used to communicate with suppliers and customers outside of Malaysia, including Line and Kakao Talk. The interviewee discusses that businesses especially in Malaysia, must use these technologies to remain competitive

The interviewee explains further:

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*Interviewee:-Information, speed and things on WhatsApp,*

*Interviewee:-Yes. We use WhatsApp, we use Skype. (laughs) we use WhatsApp, we use your Skype, we use E-mail, use internet, use Kakao Talk.*

*-In Malaysia, its WhatsApp, I mean in Taiwan, its using Line, and China is using We Chat. So every country have a different, this type of applications.*

*"See then. I need to look at it and then may be I have a picture, then I have to go and see, hello I am calling, and then they used to be there, or I'll come or you'll see that, a few meetings is lost. We just because we are sitting just nearby, a few meetings is lost. But in WhatsApp, I don't need to go and look for anything. I just take the picture, pop, send to him, did you know this item?"*

***"WhatsApp is helping"***

*And fast. We've got E-mail of course, in the Inbox, in our server, of course we can carry, but certain unofficial communication, unofficial communication, as a chat. We can do here, Skype and WhatsApp.*

*Interviewee: I recognize that only 1% in Malaysia, I know, is not using WhatsApp. (they laugh). We need it. I don't even know him and I have him as a contact*

*Interviewee: See. You cannot run away from technology.*

*Know what, again, any technology makes you more tired. Earlier, okay maybe you are not in that generation. While there was E-mail, we were, fantastic, this E-mail. We're waiting any E-mail will come on our, or maybe per day will come one mail. All right? What we received. But our post box will be full of letters. Okay. So nowadays, it's changed.*

*Interviewee: When we used to use our fax, we only used to get one fax and we were so excited to hear the fax. (they laugh)*

*Interviewee: I remember when my ex-company per day I will receive probably around 300 E-mails at least.*

*Interviewee: So, you see the difference. Why are they looking at our inbox, those days, when E-mails were exciting? E-mails, but our mail box will be, our house mail box will be full and filled up in old days. Nowadays, the technology is changing. The*

*mail box here is full and then our house mail box, is only one letter. So we are excited to get.*

---

Other tools used are Kakao Talk, Skype, and Line, these mobile technologies are used to communicate with regional suppliers including China and Taiwan. The interviewee supports below:

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*Interviewee:-Yes. We use WhatsApp, we use Skype. (laughs) we use WhatsApp, we use your Skype, we use E-mail, use internet, use Kakao Talk.*

*-In Malaysia, its WhatsApp, I mean in Taiwan, its using Line, and China is using We Chat. So every country have a different, this type of applications.*

---

This section highlights the use and some disadvantages of the use of mobile communication tools used by Case C. In the following section, the problems and issues with the existing tools will be discussed.

#### 4.7.1.3 Problems and Issues With the Existing Tools

In the previous section different mobile communication tools used by Case C, including Whatsapp, Line, Skype, and Kakao were identified as tools that are used to support supplier selection, and to trade with other suppliers and customers. Although there are many advantages of these tools, including speed and access to data, as this encourages effectiveness and efficiency, it does not come without disadvantages. One

of the highlighted positives, is that information can be communicated instantly, but this method is an informal way of communicating, therefore, information will then need to be recorded on to the main system, presenting itself with repetitive workloads, and data-inaccuracy and in some cases duplicate records. The interviewee also mentions the change in technology, where companies are forced to use mobile communication tools so they can compete with the competitive manufacturing market. The interviewee explains further:

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*Even though we are little bit older, we are up to the technology, we are using. WhatsApp, Skype and things and all. Even this morning, I scolded a colleague, can you install a Skype? Because you see, again, while we are checking our E-mail, the Skype would pop up, and then we can reply them fast. Technology. So otherwise, even though WhatsApp is beginning to take up for my pockets and answers, time is lost. That's true. Whenever you are to expose these kind of things.*

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The following section will discuss the emerging theme, the Malaysian culture on information technology in Malaysian manufacturing.

#### 4.7.1.4 Malaysian Culture

In the above section, the different information technology tools used by case C were highlighted. The tools highlighted were types of mobile communication tools, including Whatsapp, Skype, Line and Kakao Talk. These tools allow for Case C to communicate with suppliers and customers in locally, regionally and internationally. These tools are popular tools used and forces companies like case C, to update their technology to

compete with their competitors. The interviewee explains that there is a very small percentage of companies that are not using these tools, as there is a “now” culture. There is a demand for instant communication and instant answers or you are at risk of losing business. The interviewee explains:

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*-In Malaysia, its WhatsApp, I mean in Taiwan, its using Line, and China is using We Chat. So every country have a different, this type of applications.*

*I recognize that only 1% in Malaysia, I know, is not using WhatsApp. (they laugh). We need it. I don’t even know him and I have him as a contact*

*I think that Malaysia is on looking results and numbers.*

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In conclusion, this section highlighted the information technology tools used to support the supplier selection process for Case C. Mobile communication technologies were seen as the most widely used tools supporting day to day business. Disadvantages were also highlighted and the emerging theme was also discussed. In the following section the use of business intelligence tools will be highlighted.

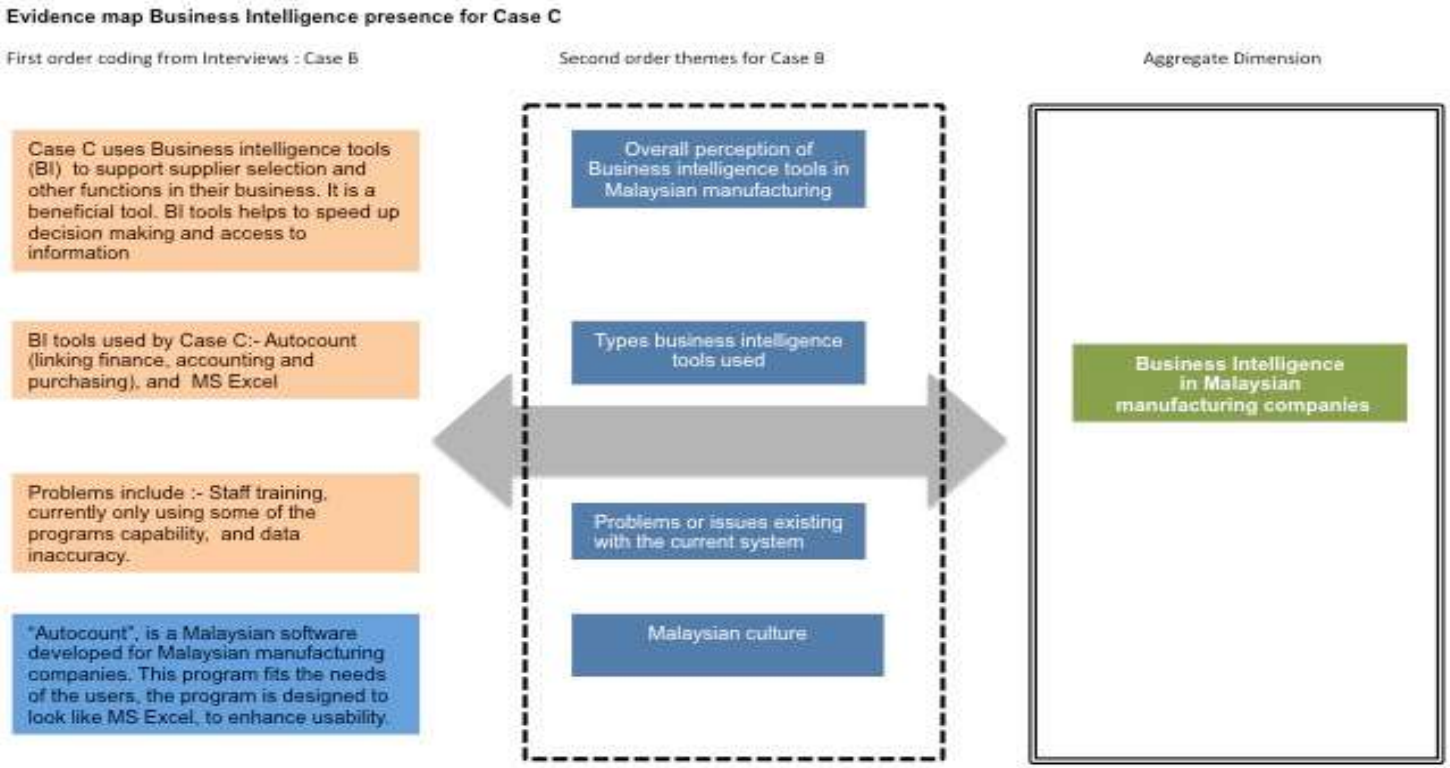


*Figure 4.21 Shows the evidence map for the Business Intelligence presence for Case C.*

### 4.7.2 Business Intelligence Dimension for Case C

The above evidence map identifies and highlights the main findings for the presence and usage of business intelligence tools (BI) for Case C. This section of the case study, will illustrate the overall perspective, types of tools used and the problems and issues and it will pay mention to the emerging theme - the Malaysian culture.

The following section will discuss the overall perspective of BI tools of Case C.

#### 4.7.2.1 Overall Perception of Business Intelligence (BI) Tools and Technologies for Case C

Case C, uses many tools to support their supplier selection, supplier evaluation and many other processes conducted during their day-to-day business. In earlier chapters, the presence of information technology tools was stated and described, and further to this, Case C, uses some business intelligence tools to support their supplier selection, supplier evaluation and other processes.

Business intelligence tools are viewed as a beneficial tool to assist in storing data (supplier information, amount of sales etc.), and to enable fast decision-making. The interviewee also explains that BI tools also allow and promote information sharing between departments. Their system is accessible to their finance, accounting and purchasing, as there is an inter-relationship between these departments for supplier selection, supplier evaluation and the purchasing of goods.

The interviewee explains further:

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*Hmm. because without it, we would still be manual.*

*Yeah, of course business intelligence, not only for supplier selection, business intelligence tools supports for supplier selection, for source the supplier, its very important. Next, the data mine tools.*

*Interviewer: Yeah. All right. And do you think that it helps with your decision making? Like, use of information technology.*

*Interviewee: Yeah. Helps a lot. Speed.*

*Interviewee: Speed.*

*Interviewee: Speed.*

*Interviewee: Access to information.*

*This is linked in between finance, accounting, purchase*

---

This section illustrates the overall perception from Case C of the use of business information tools. For Case C, BI tools are used for information storing of their

suppliers and for information sharing with different departments. The interviewee also states that without these tools, the company would still be manual and without control over their suppliers. In the following section the different tools used by Case C will be described and stated.

#### 4.7.2.2 Types of Business Intelligence Tools Used by Case C

In the previous section (the overall perspective of the use of business information tools), the findings illustrate that Case C uses BI tools and also viewed it as a benefit to their business functions. For Case C, the business intelligence (BI) tools have been identified as Autocount and MS Excel. This chapter will explain how these tools are used.

***Autocount***

Autocount is a software that has been developed in Malaysia for the use of manufacturing companies in Malaysia. Autocount allows for certain departments responsible for suppliers and sales to be merged. These departments include: purchasing, accounting and finance. The details stored in this program incudes: supplier name, address, contact details, outstanding purchase orders, credit limits for suppliers, supplier evaluation past performances and ISO registrations. The system works where the required forms are completed for new suppliers and sent to the finance department for approval. After which, the finance department will input the new supplier onto the system, and the accounts department will then open an account for each new supplier. The system is also controlled by password and only managers of each department are allowed to create new fields for each supplier. The user interface also replicates MS Excel; the intention of the design was to assist usability for end users.

The interviewee explains:

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*So, three departments, are being, are linked together with software*

*Key information, what kind of information we need to put here at is supplier, a new supplier selection. So we will need to go through the ISO configuration, things and all. And once I signature, the accounting, finance will, put it there.*

*Interviewee:-Open the account for them.*

*Interviewee: That's for supplier. Any new item, new item, so I can create. Only my password is allowed to create. Manager's password. So the purchasers are not allowed to create any new partner.*

*Interviewee: Existing. Whichever.*

*Interviewee: Okay. Are there always stuff written…also it is a Malaysian company.*

*Oh this is supplier list. In order to raise PO, we need supplier. Then we need to have stock items. Stock item means one of the things that which we go to buy. So we need to, every item has its own code, its own description. And then, we call under commodity, a group. We need to, because why we need to create a group is because whenever we buy, end of month, the finance will be calculated. Okay so*

*this item buy for IT use. IT for production. So this is aligned internally then we name it as group, what group it is. All right? And then shelf is a number for stock count. Some item, not everything we use is stock controlled. So we have, which ever item is stock controlled, we tick it. Right? So, second is, is it active or not. Some items, will be deactivated because it's not in use, in greater time. So totally we have about 475….*

*It's PO, date, delivery date fallen, terms, payment terms. All right? This is the, my receipt of urgent. So always, so then after they have picked up and thing and all, they will come for signature to me. And what's the security added over here is, every PO they can print out only once.*

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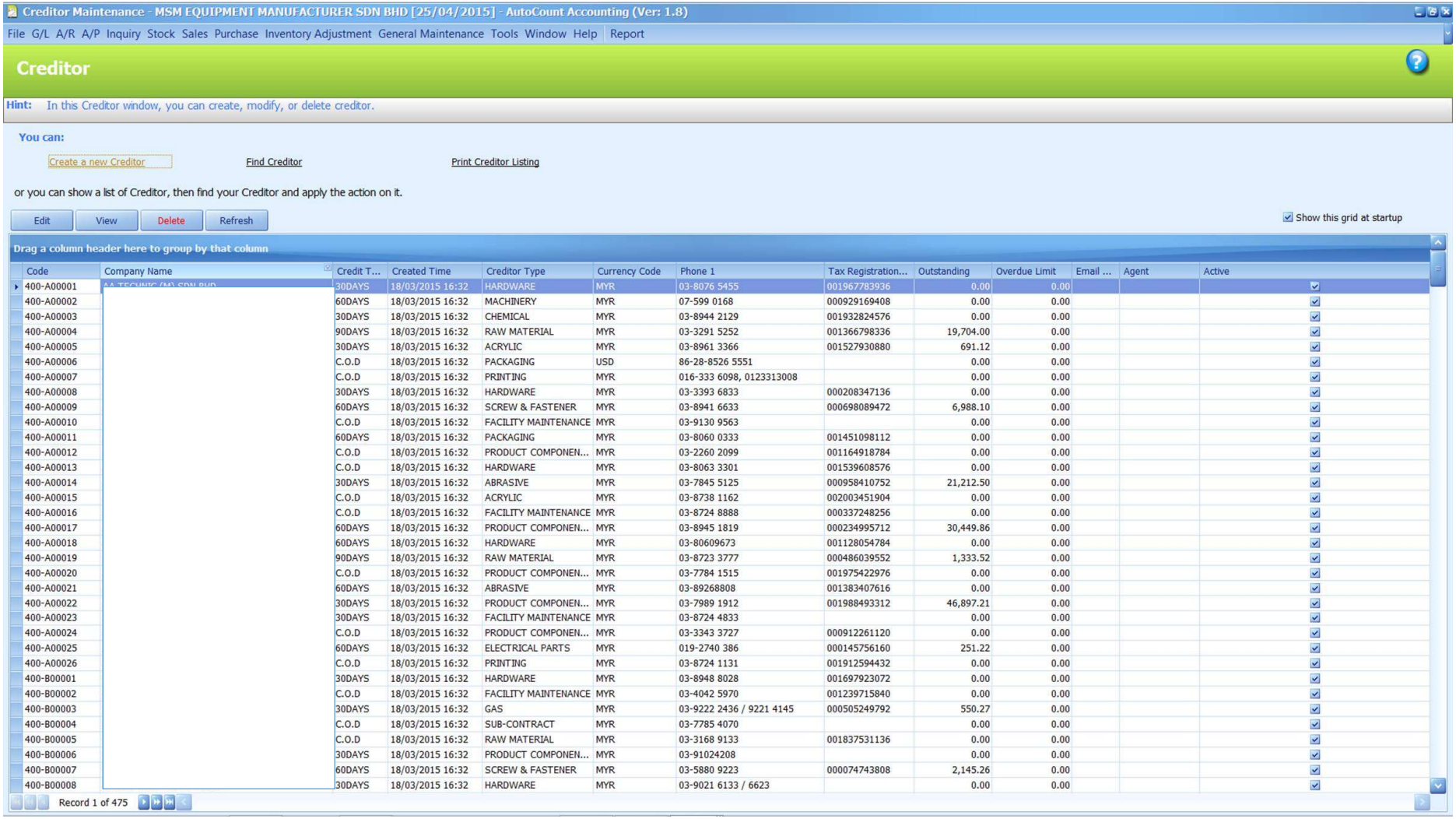
The following image shows the Autocount interface:




| Code | Company Name | Credit T... | Created Time | Creditor Type | Currency Code | Phone 1 | Tax Registration... | Outstanding | Overdue Limit | Email ... | Agent | Active |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400-A00001 | | 30DAYS | 18/03/2015 16:32 | HARDWARE | MYR | 03-8076 5455 | 001967783936 | 0.00 | 0.00 | | | ☑ |
| 400-A00002 | | 60DAYS | 18/03/2015 16:32 | MACHINERY | MYR | 07-599 0168 | 000929169408 | 0.00 | 0.00 | | | ☑ |
| 400-A00003 | | 30DAYS | 18/03/2015 16:32 | CHEMICAL | MYR | 03-8944 2129 | 001932824576 | 0.00 | 0.00 | | | ☑ |
| 400-A00004 | | 90DAYS | 18/03/2015 16:32 | RAW MATERIAL | MYR | 03-3291 5252 | 001366798336 | 19,704.00 | 0.00 | | | ☑ |
| 400-A00005 | | 30DAYS | 18/03/2015 16:32 | ACRYLIC | MYR | 03-8961 3366 | 001527930880 | 691.12 | 0.00 | | | ☑ |
| 400-A00006 | | C.O.D | 18/03/2015 16:32 | PACKAGING | USD | 86-28-8526 5551 | | 0.00 | 0.00 | | | ☑ |
| 400-A00007 | | C.O.D | 18/03/2015 16:32 | PRINTING | MYR | 016-333 6098, 0123313008 | | 0.00 | 0.00 | | | ☑ |
| 400-A00008 | | 30DAYS | 18/03/2015 16:32 | HARDWARE | MYR | 03-3393 6833 | 000208347136 | 0.00 | 0.00 | | | ☑ |
| 400-A00009 | | 60DAYS | 18/03/2015 16:32 | SCREW & FASTENER | MYR | 03-8941 6633 | 000698089472 | 6,988.10 | 0.00 | | | ☑ |
| 400-A00010 | | C.O.D | 18/03/2015 16:32 | FACILITY MAINTENANCE | MYR | 03-9130 9563 | | 0.00 | 0.00 | | | ☑ |
| 400-A00011 | | 60DAYS | 18/03/2015 16:32 | PACKAGING | MYR | 03-8060 0333 | 001451098112 | 0.00 | 0.00 | | | ☑ |
| 400-A00012 | | C.O.D | 18/03/2015 16:32 | PRODUCT COMPONEN... | MYR | 03-2260 2099 | 001164918784 | 0.00 | 0.00 | | | ☑ |
| 400-A00013 | | C.O.D | 18/03/2015 16:32 | HARDWARE | MYR | 03-8063 3301 | 001539608576 | 0.00 | 0.00 | | | ☑ |
| 400-A00014 | | 30DAYS | 18/03/2015 16:32 | ABRASIVE | MYR | 03-7845 5125 | 000958410752 | 21,212.50 | 0.00 | | | ☑ |
| 400-A00015 | | C.O.D | 18/03/2015 16:32 | ACRYLIC | MYR | 03-8738 1162 | 002003451904 | 0.00 | 0.00 | | | ☑ |
| 400-A00016 | | C.O.D | 18/03/2015 16:32 | FACILITY MAINTENANCE | MYR | 03-8724 8888 | 000337248256 | 0.00 | 0.00 | | | ☑ |
| 400-A00017 | | 60DAYS | 18/03/2015 16:32 | PRODUCT COMPONEN... | MYR | 03-8945 1819 | 000234995712 | 30,449.86 | 0.00 | | | ☑ |
| 400-A00018 | | 60DAYS | 18/03/2015 16:32 | HARDWARE | MYR | 03-80609673 | 001128054784 | 0.00 | 0.00 | | | ☑ |
| 400-A00019 | | 90DAYS | 18/03/2015 16:32 | RAW MATERIAL | MYR | 03-8723 3777 | 000486039552 | 1,333.52 | 0.00 | | | ☑ |
| 400-A00020 | | C.O.D | 18/03/2015 16:32 | PRODUCT COMPONEN... | MYR | 03-7784 1515 | 001975422976 | 0.00 | 0.00 | | | ☑ |
| 400-A00021 | | 60DAYS | 18/03/2015 16:32 | ABRASIVE | MYR | 03-89268808 | 001383407616 | 0.00 | 0.00 | | | ☑ |
| 400-A00022 | | 30DAYS | 18/03/2015 16:32 | PRODUCT COMPONEN... | MYR | 03-7989 1912 | 001988493312 | 46,897.21 | 0.00 | | | ☑ |
| 400-A00023 | | 30DAYS | 18/03/2015 16:32 | FACILITY MAINTENANCE | MYR | 03-8724 4833 | | 0.00 | 0.00 | | | ☑ |
| 400-A00024 | | C.O.D | 18/03/2015 16:32 | PRODUCT COMPONEN... | MYR | 03-3343 3727 | 000912261120 | 0.00 | 0.00 | | | ☑ |
| 400-A00025 | | 60DAYS | 18/03/2015 16:32 | ELECTRICAL PARTS | MYR | 019-2740 386 | 000145756160 | 251.22 | 0.00 | | | ☑ |
| 400-A00026 | | C.O.D | 18/03/2015 16:32 | PRINTING | MYR | 03-8724 1131 | 001912594432 | 0.00 | 0.00 | | | ☑ |
| 400-B00001 | | 30DAYS | 18/03/2015 16:32 | HARDWARE | MYR | 03-8948 8028 | 001697923072 | 0.00 | 0.00 | | | ☑ |
| 400-B00002 | | C.O.D | 18/03/2015 16:32 | FACILITY MAINTENANCE | MYR | 03-4042 5970 | 001239715840 | 0.00 | 0.00 | | | ☑ |
| 400-B00003 | | 30DAYS | 18/03/2015 16:32 | GAS | MYR | 03-9222 2436 / 9221 4145 | 000505249792 | 550.27 | 0.00 | | | ☑ |
| 400-B00004 | | C.O.D | 18/03/2015 16:32 | SUB-CONTRACT | MYR | 03-7785 4070 | | 0.00 | 0.00 | | | ☑ |
| 400-B00005 | | C.O.D | 18/03/2015 16:32 | RAW MATERIAL | MYR | 03-3168 9133 | 001837531136 | 0.00 | 0.00 | | | ☑ |
| 400-B00006 | | 30DAYS | 18/03/2015 16:32 | PRODUCT COMPONEN... | MYR | 03-91024208 | | 0.00 | 0.00 | | | ☑ |
| 400-B00007 | | 60DAYS | 18/03/2015 16:32 | SCREW & FASTENER | MYR | 03-5880 9223 | 000074743808 | 2,145.26 | 0.00 | | | ☑ |
| 400-B00008 | | 30DAYS | 18/03/2015 16:32 | HARDWARE | MYR | 03-9021 6133 / 6623 | | 0.00 | 0.00 | | | ☑ |

*Figure 4.22 The above is a screen shot of the Autocount interface for Case C*

The above image illustrates the user interface of Autocount; as shown above the interface replicates MS Excel for usability for the end users.

Prior to the implementation of Autocount, MS Excel databases were used to store supplier information, however there was no integration between departments. One of the advantages explained by the interviewee is that this program allows for departmental integration and this program allows an export function from MS Excel to Auto count.

Another disadvantage of using MS Excel, was that there was no security over input of data; unlike Autocount where a password needs to be inserted by a manager to input new information. The interviewee explains:

---

*They are true. Because whenever we are doing in Excel, whenever we are doing in Excel, we can alter all the information*

*Of course. And in that way, your information has standard chance to be incorrect because, I guess you just leave your computer open and you leave the database and you accidentally touch it, you delete something. So, in this case here, let's just say, you are going through an auditing process, okay? You'll look at the creditor name and your case here*

---

Eventually, MS Excel will be phased out, after all the data is ensured to be on Auto count.

This section represents the business intelligence tools used by Case C; supporting this, a print screen of the interface is given. In the following section, the problems or issues experienced will be discussed.

#### 4.7.2.3 Problems or Issues Existing with the Current System

In the previous section, the business intelligence tools used by Case C were highlighted. Although the system has been viewed as being beneficial, (as it is meant to decrease data replication, ensure data accuracy and promote departmental information sharing), there are still some problems existing.

Due to lack of training, the program is not being used to its full capabilities. The supplier of this program only offers basic training to the program. Due to this, some functions are still being executed on MS Excel. The interviewee explains:

---

*Because its still new, as I mentioned, any system maybe, as for now I can tell maybe the usage, the usage of total features is maybe about 30%, 40%.*

*They provide but a very basic.*

*Because this is very similar to how Excel looks and how Excel operates but in a more simplistic form. So maybe you don't really need much support from them. I think probably, that's what they were going for. That, it looks just like a spreadsheet. It has the same functions as the top as a spreadsheet. Then at the top, under report, on the heading, does that generate reports for you?*

*-This is quite simple. And I am happy with this system. If we're stable with system, because, whether the nothing, we need the basic.*

*Okay. So the only difference, to this than Excel is that you are able to integrate all different functions like finance, accounting and purchasing and you are able to do, to manage your stock. In a more automated way. Look at your, you inventory and you can do reports. Which is, you couldn't do that with Excel because in Excel you have to import the information to all departments.*

*Auto Count, the database have a central data,*

*Interviewee:-Central data to link together.*

*Interviewee:-So everyone is interlinked*

---

This section explains the issues that are experienced by Case C in relation to their business intelligence tools and technologies. The following section will highlight the emerging Malaysian culture theme on business intelligence.

#### 4.7.2.4 Malaysian Culture - Case C

The Malaysian culture theme is a theme that emerged from the data, and this section presents the findings for Case C.

For business intelligence, one of the main tools identified, was a tool called Auto count, this program is Malaysian software produced for the use of Malaysian manufacturers. The interviewee states that in earlier times, as there was a need for support from business intelligence, the company used SAP, but found it too complicated and it was not flexible enough for their type of business. There is a preference to use Malaysian software to support their business.

The interviewee explains:

---

*This is what I tell you about Auto Com. This is, what I heard, this is a Malaysian software but is good enough. So we used the SAP earlier before. Not here. SAP is too advanced. Too advanced. SAP.*

*Interviewee:-It's too advanced*

*Interviewee: Aah..certain industries, my previous industries, we used, so..have you heard about the Sideline, its an American program*

*Used Sight Line, that's good enough for it. But after we go and migrate to SAP, its too details in and then a lot of, but advantage, good for company. Good for the company, means, still remember I tell you a material, we buy a material and then it*

*will, planning will their plan. Okay? Production plan. So whenever they already changed the production plan, the system will pop a message to you, this material, don't push out. So we have a lot of tough times. Thousand lines to push out, don't deliver, suddenly a planning or a customer will, okay tomorrow I'll change. Then the message will be 'pull in'. Autocount allows us the flexibility and simplicity we need.*

---

This section illustrates the impact of Malaysian culture by the use and implementation of software that is specifically made for Malaysian manufacturers. This system competes with other BI programs; for instance Sidelines, and SAP. The interviewee feels that this system is more suitable for their business operations for usability and flexibility. The manufacturers of the program understand the Malaysian manufacturers needs, and caters for them.

The following section will illustrate the Artificial intelligence dimension for Case C.

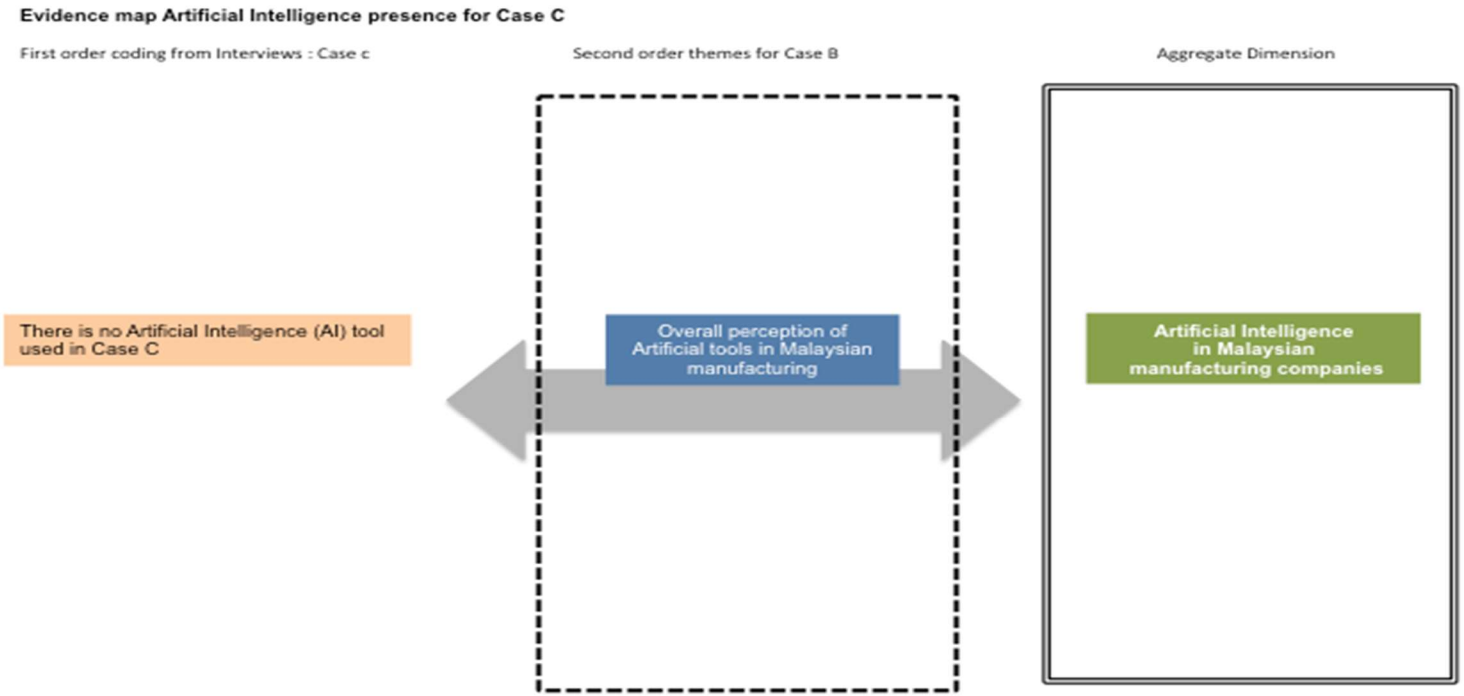



*Figure 4.23 The above evidence map shows the artificial Intelligence presence for Case C.*

### 4.7.3 Artificial Intelligence Presence in Case C

The above evidence map highlights the findings for the artificial intelligence presence for Case C. As shown above, there is no presence or usage of artificial tools or technologies in Case C.

The interviewee made no mention of this in the interviewing process.

In conclusion, this case study represents the following: supplier selection dimension, highlighting the supplier selection process, supplier evaluation, how suppliers are sourced, problems and issues in supplier selection and moreover, information technology usage and presence, highlighting the common usage of mobile communication tools to support supplier selection and purchasing. Additionally, it includes the presence and usage of business intelligence tools, and the presence and usage of artificial intelligence tools and technologies. Furthermore, the emerging themes of Malaysian culture have been highlighted.

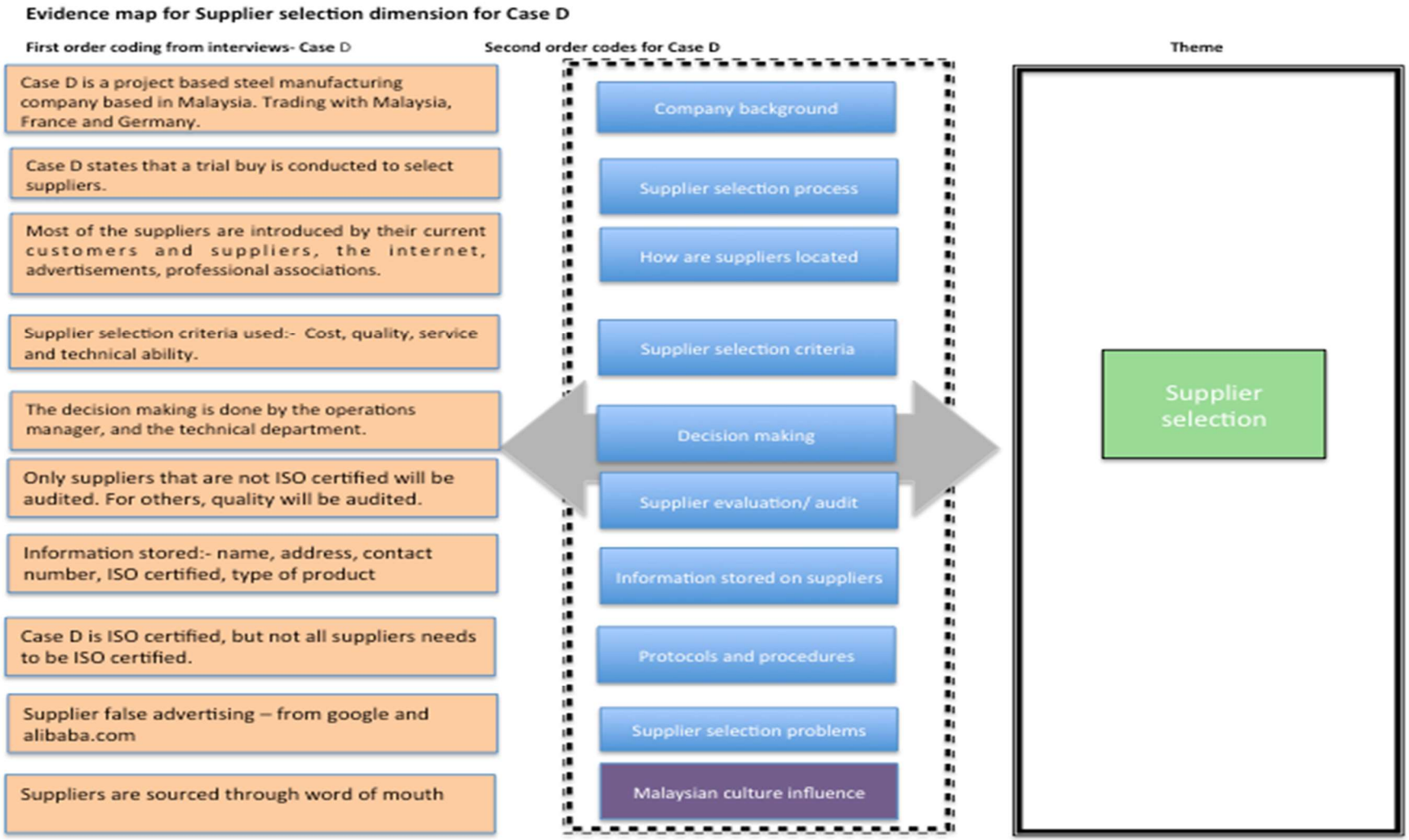



*Figure 4.24 - The above figure shows the evidence map for the supplier selection decision making process for Case D*

## 4.8 Case Study D

The above evidence map represents the main findings for Case D for supplier selection. In this section, the following topics will be discussed: company background, their supplier selection process if any, how suppliers are located or sourced, the main supplier selection criteria, their decision-makers, their supplier evaluation or audit process, what information on suppliers is stored, protocols and procedures, supplier selection problems or issues and the emerging theme - the impact of Malaysian culture.

The first section will explain the type of company and the countries that they trade with.

### 4.8.1 Company Background

Case D, is described as a company that is ten (10) years old, and can be described as a project based company, manufacturing steel-based products. Initially, the company's background provided a solution to a supply chain issue, of a lack of suppliers for a particular product. After the project was completed, the company diversified itself in producing small fixtures, and the making of small machines. One of the main assets of Case D is its core expertise in engineering, where they are able to expand their range of products. This asset allows them to secure project-based work in different areas of business, including oil and gas, architecture, and the food industry.

The interviewee supports:

*Project management. So it was a one-man show and I was the one. So what we did was, we designed and built a machine from scratch. It is a PET. So PET bottles are like coca cola bottles so among that two of those machines that are qualified for coca cola bottles, one is cedel, it is a French made machine and other one is chromas, a German made machine. So my client they actually were in Malaysia for 10 years, however similar like you, they had problem with supply chain, so they had over 70% of parts that they still import globally. Local contacts are only 10%. So kind of monthly speaking is not viable for them to manufacture in Malaysia. So the French director says, now since we are here for 10 years, why can't we design a machine. We manage to finish the project within short months in the allocated budget. The deadline was very finite because the moment we finish the machine, we would have to send it for an exhibition in Germany. So there is no delay or no extension what's so ever allowable. So we finish on time and we finish it below the budget. So we sent to the exhibition Germany, and they sold 25 machines on the exhibition so it was a big success. The French director was so happy he had signed me up for a second contract. It was to localize their French design. I was very happy. Life was good. Then they decided to move to Beijing. They invited me to go to Beijing as well, but Beijing was never my cup of tea, so I decided to stay back. So I started to get a little more hands on. We started to design malls, fixtures, small machineries and also assembly. Now today our core competency is actually design, contract manufacturing, fabrication and also our engineering services.*

Moreover, the countries that Case D trades with include Malaysia, France and Germany. The interviewee supports below:

*All physically located in Malaysia but the origin of their mother company mainly from Europe which is France, Germany, Americans and that's about it. We don't deal with Dutch anymore.*

In this section, the company background is highlighted, and the countries that trade are included. One of the assets of Case D is their speciality in engineering, which allows them to extend to a wider market than some other manufacturing companies. The following section will divulge their supplier selection process.

### 4.9.1 Supplier Selection Process

In the previous section, the company background was discussed, and the key elements of Case D: they are a project-based company and their asset is their engineering background. This section will illustrate their supplier selection requirements as explained by the interviewee.

Firstly, it was declared by the interviewee that Case D, is an ISO certified company. This certification impacts the way that Case D conducts their business, maintains their products and their interactions with their suppliers and vice versa. In this case, the specified ISO certification was not mentioned, but the interviewee mentioned that the ISO does have an impact on the qualification of some of their suppliers. One of the actions performed to conform with the ISO certification, is to conduct a site visit to ensure the quality of service and product they will be providing to Case D and that the

supplier has the technical competency to complete a task, so the end product will conform to Case D's ISO certification.

The interviewee also mentions that some of their suppliers are ISO certified but that some of their suppliers are not ISO certified.

This will result in their suppliers being classified differently for evaluation purposes. Further to this, if the site visit is satisfactory, a trial buy will be conducted and the supplier will be placed on their inactive approved supplier list. The evaluation process, the delivery time, cost and technical ability will be reviewed.

The interviewee explains further:

---

*ISO*

*"First of all, we are ISO certified company. So we do have a set of procedure on the qualification of our vendor. So we do visit our vendor to ensure what kind of service and product they supply to us they actually have competency of doing it themself. Of course we also have trading suppliers. So we categorize our vendors differently. So the selection will be different. So if it our subcontractor we definitely must ensure that they do have the machinery or necessary equipments to manufacture the parts that we purchased from them. Not only that they must have the quality equipment to actually ensure the quality of the products they deliver to us. I think those are the key points".*

*"We don't even need them to be ISO certified".*

---

### Trial Buy

---

*"Yes most of time, we buy from them and see what happens".*

*"Actually the first one would give you a strong hint. If they are good then we will order again. If they are not good then we forget about them".*

---

In this section, ISO certification was mentioned to a requirement for the supplier selection decision-making. Although the interviewee did not mention the ISO certification, the emphasis is placed on quality service and to ensure the technical capabilities of the new supplier. The interviewee also mentioned that suppliers do not necessarily need to hold an ISO certification to be approved as a supplier, however, the decision to keep them as an active supplier will be made after their first transaction. The following section will highlight how suppliers are sourced for Case D.

#### 4.9.2.1 How Suppliers are Sourced or Located.

This section will illustrate the different methods or channels used by Case D, to source or locate new suppliers.

The interviewee mentions that the majority of their suppliers are referred by "word of mouth".

The interviewee supports:

***Word of mouth***

> *"Most of my customers are introduced by my customers well up north. So this guy introduced to another guy and so and so forth and with a lot of years we just had them".*

Another method used to source or locate suppliers is professional societies, or professional associations. The interviewee states:

***Professional association***

> ***Malaysia Automation Technology Association (MATA)*** *and those land us a few jobs as well. Actually last year we were appointed one of the three Malaysian consultants to actually revamp the Malaysian timber council. As a representative of the Malaysian timber council to revamp the timber industry in Malaysia*

As mentioned in the above quote, MATA allows Case D to expand their customer base by professional association.

Moreover, the interviewee states that Google and Alibaba.com are rarely used. The interviewee states that for Case C, these tools are rarely used due to incorrect information.

The interviewee explains:

---

*INTERVIEWEE: you mean beside Google?*

*INTERVIEWEE: No. we don't even use Ali Baba.*

*INTERVIEWEE: But sometimes on Google, the information isn't always correct.*

---

In this section, the sourcing and location of suppliers is highlighted, and for case D, word of mouth and professional association is mostly used. Google and Alibaba.com are not used as the interviewee states that most times the information gathered about suppliers through these sources is incorrect.

The following section will present the pertinent supplier selection criteria adhered to by Case D.

#### 4.9.2.2 Supplier Selection Criteria

In the company background section of this case study, Case D is described as a project based company, which requires them to produce their products according to an agreed time. For Case D, the interviewee presents their pertinent criteria as cost, quality and service.

As one of the core competencies of Case D is engineering, technical capabilities are viewed as a non-negotiable criterion.

The interviewee explains further:

*INTERVIEWEE: Cost, quality, service.*

*If they don't even have the necessary technical We don't even consider them around so we don't even ask them to give us a call so we wouldn't know the cost, we wouldn't know their quality as well. We wouldn't try them so we wouldn't know their services as well.*

In this section, the main criteria identified is quality, service, cost and technical capabilities/ability. The interviewee states that if a potential supplier does not possess the necessary technical capabilities, the supplier will not be considered.

In the following section the decision-makers will be highlighted.

#### 4.9.2.3 Determining who is Responsible for Decision-Making

This section will present the supplier selection decision-makers for case D.

As stated in the company background section, this company makes steel-based product, and due to this, many people are involved in the supplier selection decision-making process. For Case D, the operations manager, productions specialist, and the managing director (the interviewee) are sometimes all involved in making the supplier decision, due to the nature of their business.

*The interviewee explains:*

*At this moment of time. The operation manager and also I have a machinery specialists as well and also I have production executive. They are taking care of different division. So they are taking care of different suppliers as well. Depending on the nature of the suppliers each of them is taking care of decision making of different set of suppliers.*

This section presents the decision-makers of Case D, and also shows that the decision-making is impacted by the nature of their business.

The following section will explain the supplier evaluation/audit process of Case D.

#### 4.9.2.4 Supplier Evaluation/ Audit Process

This section will present the process that is undertaken by Case D to audit their current suppliers.

Firstly, the interviewee states that their approved supplier list is small, as it consists of thirty (30) suppliers. Secondly, the interviewee states that their auditing is simplified as their approved supplier list is divided into suppliers who are ISO verified and those who are not ISO certified.

For suppliers who are ISO certified, no audit is conducted as Case D assumes that these suppliers are adhering to the ISO's rules and regulations. The interviewee further explains, that in order for a company to maintain their ISO certification, these companies will be reviewed annually by the ISO regulators to ensure quality and service. The reason for this decision, is a lack of resources for case D. The interviewee explains

below:

> *"Depending on the category of the suppliers. Not all require to be audited and due to our limited resources as well, the buyer which is ISO certified we will assume that they have been audited annually by whoever the certification authority is. So we just skip the audit process for the ones with ISO certified."*

For those suppliers who are not ISO certified, quality and service is reviewed. The interviewee states below:

> *Maintenance, whether they have the equipment to manufacture, quality, whether their quality system is in place*

This section highlights the supplier evaluation process of Case D. The process is hindered by a lack of resources, resulting in only suppliers who are not ISO certified being reviewed.

In the following section protocols and procedures are adhered to.

#### 4.9.2.5 Protocols and Procedures

In the company background section, it is stated that Case D is an ISO certified company. Although the interviewee did not specify which particular ISO certification is adhered to and followed, quality and service are highlighted as the main areas reviewed when referring to their ISO certification. The interviewee states below:

*"First of all, we are ISO certified company. So we do have a set of procedure on the qualification of our vendor. So we do visit our vendor to ensure what kind of service and product they supply to us they actually have competency of doing it themselves".*

*"Depending on the category of the suppliers. Not all require to be audited and due to our limited resources as well, the buyer which is ISO certified we will assume that they have been audited annually by whoever the certification authority is. So we just skip the audit process for the ones with ISO certified".*

Although the specific ISO certification was not stated, Case D confirms that the company adheres to the ISO certification, and quality and service is highly important to maintaining their ISO certification. The following section will discuss the problems or issues experienced by Case D, in the supplier selection decision-making process.

#### 4.9.2.6 Issues/Problems Experienced in the Supplier Selection Process

This section of the case study showcases the problems or issues experienced by Case D in their supplier selection decision-making process.

Previously mentioned in the location or sourcing of suppliers (section 5.9.2.1), the interviewee states that very rarely the search engines are used to assist or support in

locating or sourcing suppliers. The interviewee mentions that in most cases, the information is incorrect or in some cases false.

The interviewee explains below:

> *"Sometimes its Google. Our expectations are different and I have this kind of expectation perhaps the person that introduced me they only have this expectation so they paint a very nice picture and if you spoke to the sales person, of course the sales person is a pleasant person and they painted us like a freehand picture and we bought it".*

The interviewee also mentions that in some cases, site visits are conducted as a supporting method to the new supplier selection decision-making process, and at this point they are able to assess if the supplier is false, instead of purchasing the product as stated in the above scenario. The interviewee explains below:

> *"Sometimes when we are fortunate we find them during site visit, the unfortunate cases where we actually place an order and then continue which causes into another mess".*

This section highlights the problem experienced by Case D as false advertising. This factor discourages the sourcing of suppliers on the internet. In the following section, the emerging theme will be stated.

#### 4.9.2.7 Malaysian Culture

In this section, the influence of Malaysian culture is highlighted and supported by statements from the interviewee.

In the company background section of this case study, the interviewee states that the majority of their business is conducted in Malaysia, and their suppliers are sourced through referrals from people they already know and trust.

Stated as a major problem, false advertising has affected their supplier selection decision-making process, again promoting distrust for Case D.

In addition to this, Case D chose to commit to professional organisations, and in some cases this setting has provided them with project-based jobs.

The interviewee states below:

> *Malaysia Automation Technology Association and those land us a few jobs as well. Actually last year we were appointed one of the three Malaysian consultants to actually revamp the Malaysian timber council. As a representative of the Malaysian timber council to revamp the timber industry in Malaysia.*

This section of the case, presents the main findings for the supplier selection dimension for Case D. This section presents the company background, their supplier selection process, how their suppliers are sourced or located, their pertinent supplier selection criteria, their decision-makers, supplier evaluation and audit, information held on

suppliers, protocols and procedures adhered to, problems experienced in the supplier selection decision-making process and the emerging theme - the influence of Malaysian culture on the supplier selection decision-making process.

The following section will highlight the main findings for the information technology presence in Case D.

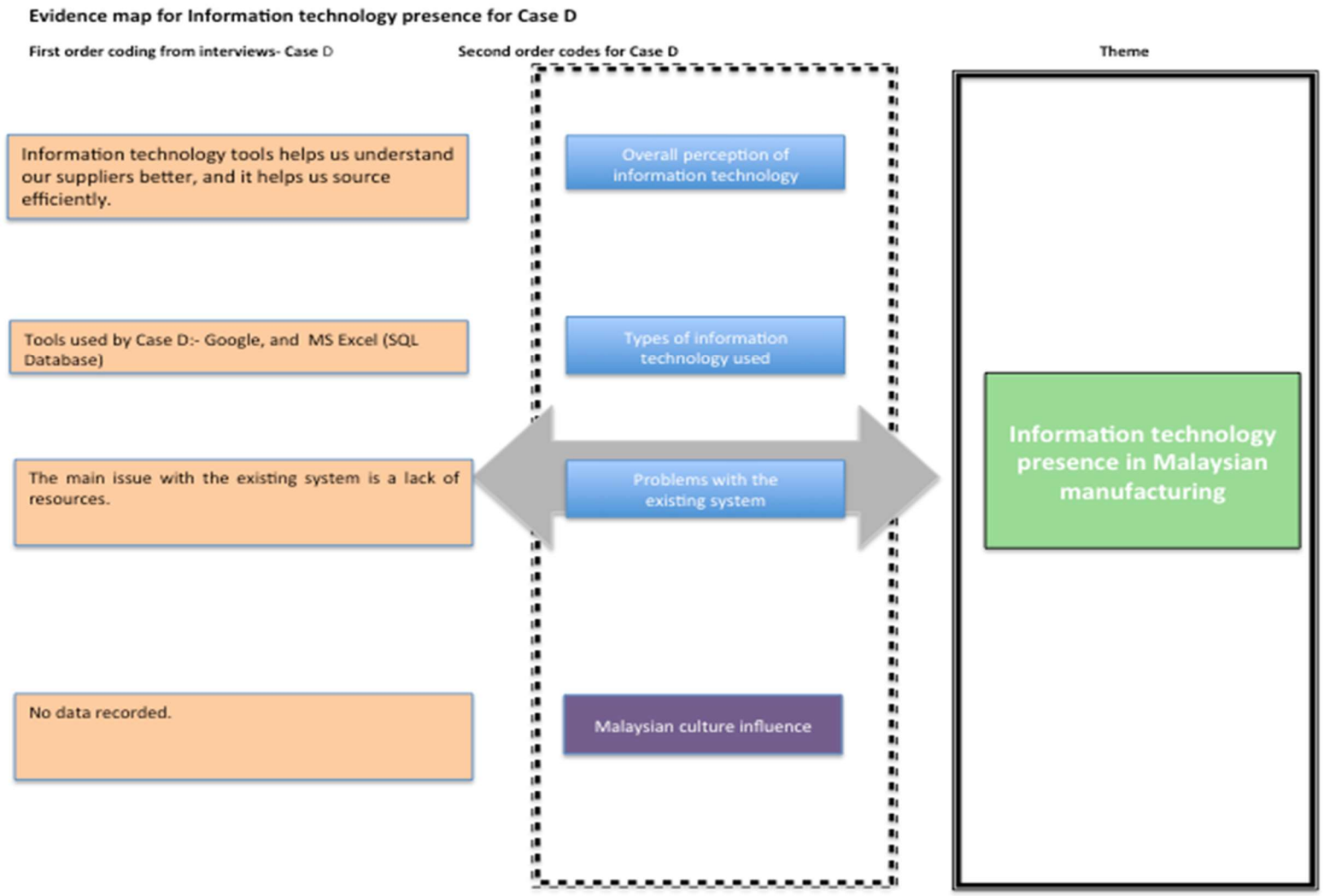



*Figure 4.25 The above evidence map shows the information technology presence for Case D*

### 4.10.1 Information Technology Presence in Case D

The above evidence map (Figure 4.25), represents the key findings for the presence and usage of information technology tools for Case D. This section will present the overall perception of Information Technology, the types of Information Technology tools used, the problems or issues experienced and the emerging theme -the impact of Malaysian culture on Case D.

The first section will highlight the overall perception of Information Technology tools for Case D.

#### 4.10.1.2 The Overall Perception of Information Technology Tools

The company manufactures steel based products, with an engineering background. For Case D, Information Technology tools are important and useful. The interviewee then relates the support of Information Technology tools to their supplier selection decision-making process and supports that use and presence of Information Technology tools is beneficial, as it allows the company to make more informed decisions on suppliers and allows them to record and be accountable to their suppliers.

The interviewee states below:

---

*"Obviously with IT. It will help because there will be things that we have not accounted for. So definitely we require IT systems to help us understand and source better".*

---

Previously, the interviewee mentions that almost all of their suppliers are sourced by “word of mouth”, however, background checks are still conducted by Case D, to ensure information given by the supplier is correct.

This section states the overall perception of the use and presence of Information Technology tools for Case D. The following chapter will present the information technology tools used to support their business.

#### 4.10.1.3 Types of Information Technology Tools Used

This section will highlight the different Information Technology tools used by Case D, to support their supplier selection decision-making process.

The interviewee states, “Google.com, and MS Excel as the two main tools used by Case D, to support their supplier selection process and to support their day-to-day business.

---

*INTERVIEWEE: Google.*

*INTERVIEWER: Also. Do you use Microsoft databases or any type of other systems to record your suppliers? What do you use in-house?*

*INTERVIEWEE: well If we have enough time then we are using some accounting system, some simple system that can evaluate database of all the branches and first of all the transaction will be done with the accounting system. It will be Microsoft office*

*INTERVIEWER: Do you mind telling me what’s the name of that system?*

*INTERVIEWEE: SQL.*

*INTERVIEWER: Ok. So you record your suppliers as well through this system.*

*INTERVIEWEE: ya*

---

This section identifies the main tools used by Case D to support the supplier selection decision-making process. The tools have been identified as MS Excel where the SQL database function is utilised, and Google.com.

The following section will indicate the problems and issues experienced by Case D regarding the use of Information Technology.

#### 4.10.1.4 Problems/ Issues With the Existing System

This section will present the problems and issues experienced by Case D, with the use of information technology tools.

The interviewee explains that in previous years, the company used SAP software solutions, however, Case D is currently experiencing a lack of resources issue, leading them back to using MS Excel.

The interviewee supports:

INTERVIEWEE: There used to be SAPs and of course its painful with SAPs to dispatch our past system. But we don't have choice. Resources is always an issue. Once we are ready we will probably move back to ERP.

The interviewee also states that in future Case D will implement an enterprise resourcing planning system (ERP), which would be more suitable for their needs.

#### 4.10.1.5 Malaysian Culture

For Case D, no Malaysian culture data was recorded. This section of the case study highlights the presence of Information Technology tools used by Case D.

In the company background section of this case study, Case D, highlights their current status as being affected by the economic downturn and thus it has affected their business operations.

The following section of this case will present the findings for the presence of Business Intelligence tools for Case D.

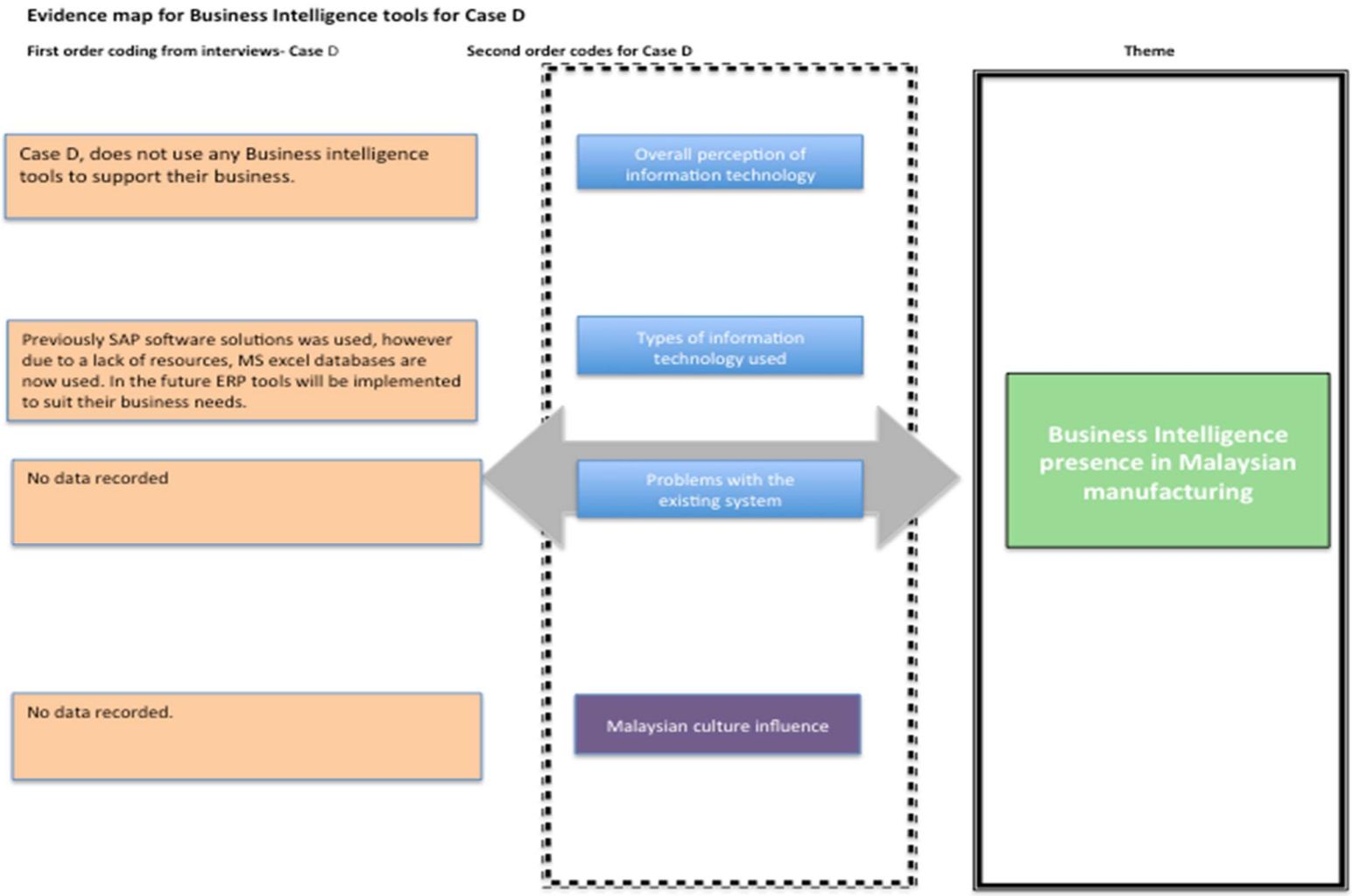



*Figure 4.26 The above evidence map shows the Business intelligence presence for Case D*

### 4.11.1 Business Intelligence Presence for Case D

In this section, Business Intelligence presence is presented. This section will highlight the overall perspective of Business Intelligence tools, the types of tools used in Case D, the problems and issues experienced with the existing system and the emerging theme - the influence of Malaysian culture.

### 4.11.2 Overall Perception of Business Intelligence Tools

For case D, the overall perception of the use of Business Intelligence tools is positive and is viewed to be beneficial supporting the supplier selection decision-making and their day-to-day business needs. Moreover, SAP software tools were previously used by Case D, however, due to lack of resources, they reverted to the use of MS Excels SQL databases.

The interviewee states:

---

*There used to be SAPs and of course its painful with SAPs to dispatch our past system. But we don't have choice. Resources is always an issue. Once we are ready we will probably move back to ERP to suit our needs, maybe from a Malaysian company.*

---

However, the interviewee mentioned that in future an ERP system will be implemented; most probably from a Malaysian software company, to meet their business needs.

This section highlights the overall perception of the use of Business Intelligence tools

for Case D. The following section will present the types of tools used by Case D to support supplier selection and other business functions.

### 4.11.3 Types of Tools Used

For Case D, the tool identified to support supplier selection is an SQL database, a function of MS Excel.

This database stores all approved suppliers, and is a shared database for all departments. The information stored includes: company name, ISO certification and contact details. The interviewee explains:

---

*INTERVIEWEE: If we have enough time then we are using some accounting system, some simple system that can evaluate database of all the branches and first of all the transaction will be done with the accounting system. It will be Microsoft office*

*INTERVIEWEE: Do you mind telling me what's the name of that system?*

*INTERVIEWEE: SQL.*

*INTERVIEWER: Ok. So you record your suppliers as well through this system.*

*INTERVIEWEE: ya*

*INTERVIEWER: Ok. The type of data that you store in your database for your suppliers will be name, location, contact. Is there any other different type of fields or any other type of information that you store on your suppliers?*

*INTERVIEWEE: I think that's basically it for now.*

---

This section represents the Business Intelligence tools used by Case D to support their supplier selection decision-making.

The following section will highlight any problems or issues experienced by Case D with their current system.

### 4.11.4 Problems or Issues Experienced

In the above section, the interviewee states that an SQL database that is enabled by MS Excel is used as their main Business Intelligence tool, used to support, not only their supplier selection decision-making process, but also their day-to-day business processes.

However, the interviewee states that this system, implemented as the SAP software suite, was not suitable for the company and there is a lack of resources. However, the interviewee states that in the future an Enterprise resource-planning tool will be implemented to suit their business needs, and this will most probably be from a Malaysian software provider.

The interviewee did mention a limitation of their current database, in that types of products provided by their supplier is not stored on their database.

The interviewee states below:

---

*Interviewer: - Ok. The type of data that you store in your database for your suppliers will be name, location, contact. Is there any other different type of fields or any other type of information that you store on your suppliers?*

*INTERVIEWEE: I think that's basically it for now.*

*Interviewer: The type of material that is used.*

*INTERVIEWEE: Those we do not put in our database because there's no such function in our system for it.*

---

---

*There used to be SAPs and of course its painful with SAPs to dispatch our past system. But we don't have choice. Resources is always an issue. Once we are ready we will probably move back to ERP to suit our needs, maybe from a Malaysian company.*

---

In this section, the problems or issues experienced by Case D are highlighted as a lack of resource, and important fields are not captured by their current system. The following section will represent the presence of Artificial Intelligence tools used by Case D.

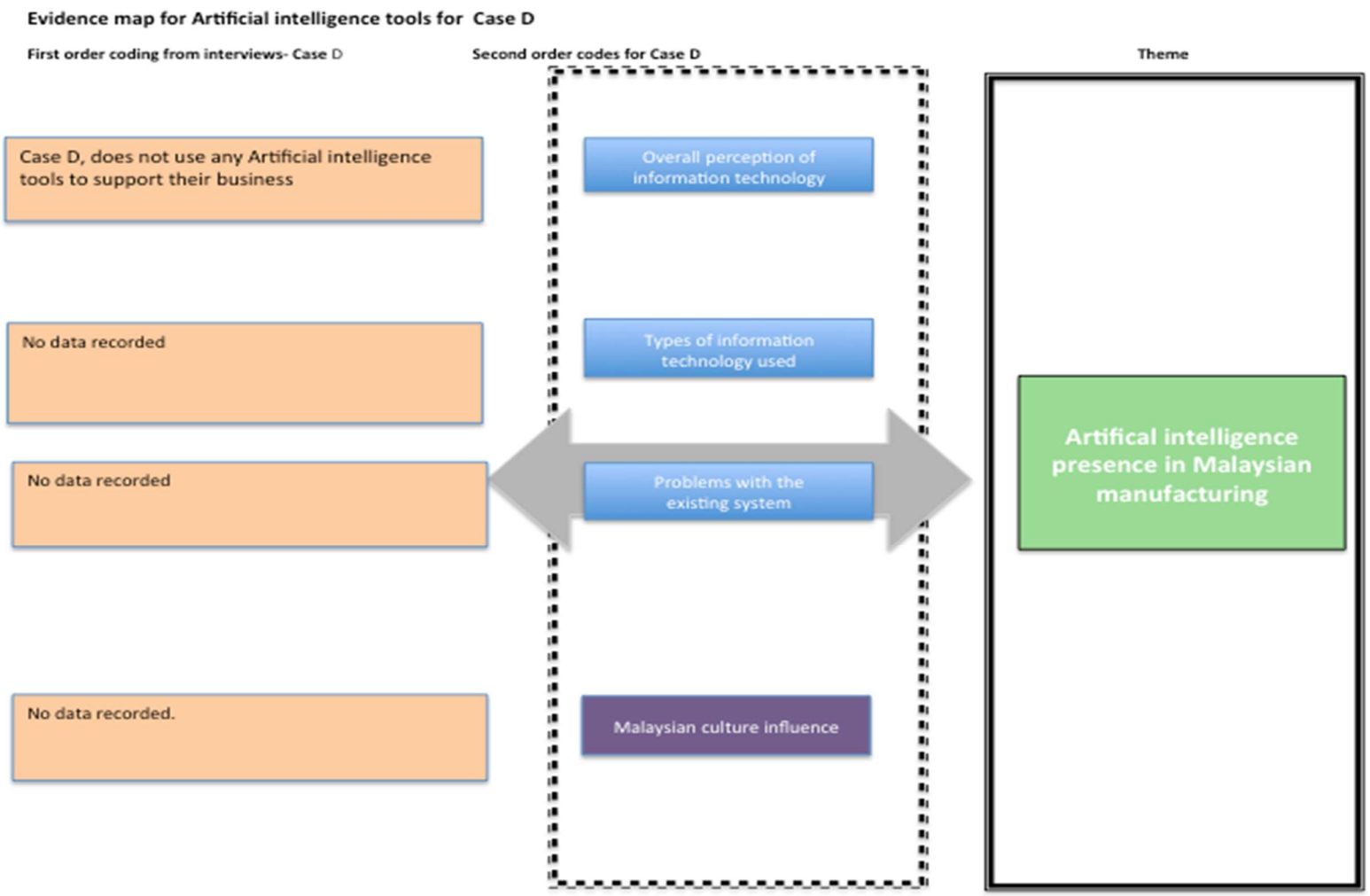



*Figure 4.27 The above evidence map shows the Artificial Intelligence presence for Case D*

### 4.12.1 Artificial Intelligence Presence for Case D

The above evidence map highlights the findings for Artificial Intelligence presence for Case D. As shown above, there is no presence or usage of Artificial Intelligence tools or technologies in Case D.

The interviewee made no mention of this in the interviewing process.

### 4.12.2 Conclusion

In conclusion, this case study represents the following: the supplier selection dimension, highlighting the supplier selection process, supplier evaluation, how suppliers are sourced and problems and issues of supplier selection, including Information Technology usage and presence and the presence and usage of business intelligence tools and the presence and usage of Artificial Intelligence tools and technologies. In addition to these, the emerging themes of Malaysian culture have been highlighted.

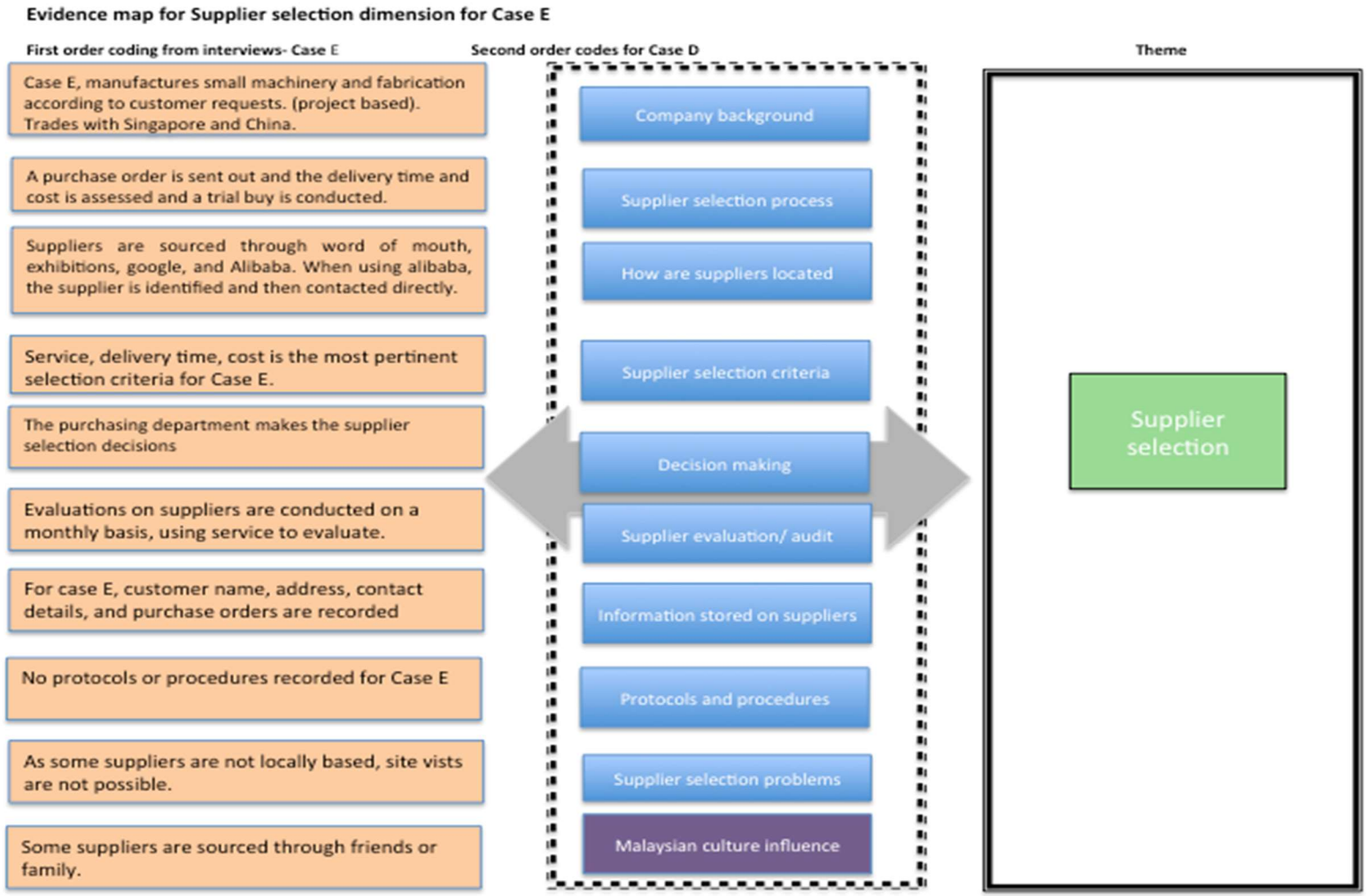



*Figure 4.28 The above evidence map shows the supplier selection decision making process for Case E*

## 4.13 Case Study E

The above evidence map presents the main findings for the supplier selection dimension for Case E. The supplier selection dimension will highlight the following topics: company background, the supplier selection process, how suppliers are located or sourced, the main supplier selection criteria used to select new suppliers, the decision makers, the supplier evaluation or auditing process, information stored on suppliers, the protocols and procedures followed, if any, problems or issues in the supplier selection process and the emerging theme - the impact of Malaysian culture.

The first section will present the company background, indicating the type of business and the countries that Case E trades with.

### 4.13.1 Company Background

Case E is described as a manufacturing company specialising in small machinery and fabrication. Customers usually submit drawings of a product that is produced by Case E and in most cases the products are steel based. Case E usually trades with Singapore and China.

The interviewee explains:

---

*We are the manufacturing, small machinery. Fabrication.*

*We do a lot. When we receive drawings from customers, and we do fabrication according to customer request.*

*Yes. It's not specified in any specific field. So once they have the drawing, we can fabricate according to drawing.*

*We have. Like Singapore and China.*

---

This section presents the type of business and the companies that Case E trades with. The following section will present the main findings for their supplier selection process.

### 4.13.2 Supplier Selection Process

In this section, the supplier selection process of Case E will be highlighted. The previous section indicates that Case E is a small machinery and fabrication manufacturing company. It is explained that in most cases, customers will submit a technical drawing and Case E will reproduce this for the customer. The interviewee identifies that their main types of suppliers are those that can supply raw materials, and one of the raw materials has been identified as steel.

The interviewee explains:

---

*Our supplier is based more on raw material. Ok we have many material suppliers.*

*Different categories, like normal supplier is a steel supplier.*

*Steel also has many different types, we select the supplier what is important is the quality, some suppliers they have control over the material very well.*

*Actually if the supplier says they have control to prevent raw material for a while.*

---

Moreover, the interviewee describes the supplier selection process, whereby; purchase orders (PO) are sent to the supplier. Following this, the supplier will respond with a quotation, listing the delivery time and cost of the raw material. If this is reasonable to Case E, the purchase is made.

The interviewee reiterates that one of the main constraints of their business is delivery time to their customers, resulting in Case E's need for a rapid delivery time from the supplier. The interviewee explains:

---

*The pricing multiplies or gets half then the cost would be there, I think not so much difference. Normally we say the quotation very close to the price. It depends on how they can provide us the fast delivery. We cannot get material up to 2 weeks' time. Absolutely cannot. 3 to 4 days is maximum. Because any customer request fast delivery. It is currently the market situation.*

---

In this section, the interviewee describes their new supplier selection process, and emphasises that their main requirement from a supplier is their ability to deliver raw goods.

The following section will describe the different methods by which Case E sources or locates new suppliers.

#### 4.13.2.1 How New Suppliers are Sourced or Located

This section will highlight the different methods used by Case E to source or locate new suppliers. In the previous section, the interviewee identifies the type of suppliers sought out by Case E, as steel and other raw materials.

The interviewee states that in most cases, word of mouth is the most common method used to source or locate suppliers. Likewise, another method identified is the attendance of exhibitions, relevant to Case E. The interviewee states below:

---

*Normally we go to the exhibition or the other people introduce us.*

*I think one supplier is introduced by my friend. Because supplier is my friends, so they already have experience, so they just introduce to us.*

---

In addition to these methods, the interviewee states that Google.com and Alibaba.com are used to source suppliers, but the suppliers will be contacted directly and not through these methods.

The interviewee explains:

---

*We use only Google oh! Ali Baba.*

*We find a supplier from there and we contact them directly*

---

Alibaba.com can be described as a global online marketplace, that provides a platform to support global wholesale trade. Alibaba.com's mission is to make it easy to do business anywhere and to allow its users to access hundreds of products in different categories. In Case E, Alibaba.com is used to source raw materials, and in some cases, one-off materials are sometimes required.

Where special material is required for a particular job, and these methods do not provide them with a solution, the interviewee states that they will revert to word of mouth and in most cases, they would be referred to countries like India and China.

The interviewee states below:

---

*So if they say they we facing this issue, I call a friend. They have the information. So and also search in the website. I think this question we facing last 2 weeks. So this special material we unable to get. So then we outsource from India and China.*

---

In conclusion, four different methods of locating suppliers have been identified for Case E. These methods include: the attendance of exhibitions relevant to their industry, word of mouth from friends and family, the Internet and Alibaba.com.

The following section, will proceed to state the most pertinent supplier selection criteria for Case E.

#### 4.13.2.2 Supplier Selection Criteria

In the previous section, the nature of the business is highlighted as a company that provides fabrication services for customers, and in most cases, these customer requests are time-sensitive. Also identified, is the type of materials - mostly raw materials.

The interviewee states that their supplier selection criteria are categorised by the type of material that is required but the criteria for all categories would be quality, pricing of cost and delivery time.

The interviewee explains further:

---

*Our supplier is based more on raw material. Ok we have many material suppliers.*

*Different categories, like normal supplier is a steel supplier.*

*Steel also has many different types, we select the supplier what is important is the quality, some suppliers they have control over the material very well.*

*Actually if the supplier says they have control to prevent raw material for a while.*

*Thus we have faced before, we buy material, but from supplier side if they unable to be punctual now or they bring us wrong raw material.*

*After that we go to secondary process the cause of the error quality is much important and service.*

*Plus the delivery also very important.*

*Because if the current market we need to complete our projects in a timely manner, due to competition.*

*Normally we have 4 weeks time to fabricate it. If they say the raw material supplier takes 1-week time, we will face problem.*

---

In the above quote, the interviewee explains their most pertinent criteria, but also highlights that Case E would need to receive raw materials in a timely manner, so they can have a competitive advantage over their competitors.

In conclusion, the main criteria for case E, has been identified and supported by quotes from the interviewee. The following section will discuss the supplier selection decision-makers for Case E.

#### 4.13.2.3 Supplier Selection Decision-Making

This section will highlight the people responsible for the new supplier selection decision-making process for Case E.

The interviewee states that the purchasing department will make the final decision on new suppliers. Initially, a purchase order will be sent to the new supplier, a quotation will be returned from the supplier giving information on quality, pricing or cost and delivery time. If these are acceptable, the new supplier is then accepted to the approved supplier list (ASL).

The interviewee describes:

---

*Normally it is decided by our purchasing department, then purchasing already selects and they will issue out the purchasing order.*

---

In conclusion, the purchasing department makes the decisions for the selection of new suppliers. In the following section the supplier evaluation or audit process will be discussed.

#### 4.13.2.4 Supplier Evaluation or Audit Process

This section of the case study will present the evaluation or auditing process conducted on existing suppliers for Case E.

The interviewee explains the auditing process is one that is conducted every three months, and service and delivery time is used as a filter to evaluate each existing supplier. In addition to this process, on a monthly basis, each supplier is evaluated on performance, the supplier will also be notified so they will be aware if there are any issues.

In the event that the supplier does not deliver goods in accordance with the agreed delivery time, the supplier will not be used again, and will be removed from the approved supplier list.

---

*The interviewee explains further:*

*Normally it is based on their service. We have monitor the service from past transactions from them. If they say this supplier always delay the delivery we will not choose them.*

*Service, cost and delivery normally. These three are most important*

*3 months, actually every month we have the supplier performance. If they say the supplier still is maintaining good service, they always get quotation from us, if they say they have any issue on delivery 1 time, 2 times.*

*Interviewer: Are they removed from your list?*

*Interviewee: yea.*

---

However, the interviewee states that this auditing process is only conducted for suppliers who do not provide raw materials.

As previously mentioned in the supplier locating or sourcing section of this case study, it is highlighted that raw materials are considered to be products such as steel. For this type of material, quality is the most important criteria, and for this mill certification is requested to prove their quality. The interviewee explains further:

---

*We audit the other supplier because this process will be more important. So the raw material supplier, we normally don't audit, because the material we can request the material certificate from them. It is a proof where the material is from which country because they provide us with a mill certification (mill cert) that means this material manufacturing is from where who is the manufacturing, we already know the supplier is verified and it is it possible to use. So we are safe in raw materials.*

---

In conclusion, the supplier evaluation process for Case E is highlighted. The evaluation process states that there is no evaluation process conducted for raw materials, and this is referred to as steel. For these products, a mill certificate is presented to the case to ensure quality. For the case of other necessary materials, an audit is conducted every three months, whereby delivery time, cost and quality is assessed.

In the following section, the information stored on suppliers will be highlighted.

#### 4.13.2.4 Information Stored on Suppliers

In this section, the information stored on suppliers will be highlighted.

For Case E, the information stored on each supplier includes: company name, contact details, location of supplier, type of material provided, (for the case of non raw material suppliers, their monthly performance outcome, and for raw material suppliers the mill certificate).

This section is concluded by stating the information stored by Case E for their suppliers. The following section will highlight any protocols and procedures followed by Case E.

#### 4.13.2.5 Protocols and Procedures

For case E, no protocols or procedures were stated or recorded. The following section will highlight the supplier selection problems experienced by Case E.

#### 4.13.2.6 Problems or Issues Experienced

This section will highlight the main problems or issues with the supplier selection process for Case E.

The interviewee highlights some of the issues or problems encountered in their supplier selection process.

### *Site Visits*

Site visits are viewed by the interviewee as one of the problems existing in the supplier selection decision-making process.

As some of the suppliers are based in India and China, it is not possible for site visits to be conducted. In some cases, these suppliers are identified by the use of Alibaba.com and there is uncertainty of the existence of the supplier, or the quality of the material. The interviewee explains:

---

*Always have supplier side information to us but I never use it. We unable to go to site visit. This is the problem.*

---

### *Availability of raw materials*

In some cases, Case E experiences difficulty in sourcing some raw materials. To solve this, Case E reaches out to friends and family to share information. However, there are cases where it is not possible to source an appropriate supplier. In this instance, Case E would need to inform the supplier; resulting in losing the job.

The interviewee explains further:

---

*We do inform the customer that we need to import this material and I think it take how many weeks, then ok. If they accept, then we do it. If customer say they are*

*out, we unable to do anything. Because the Malaysian market don't have this material. We cannot do anything.*

---

In conclusion, the problems or issues identified by Case E relate to access to materials and the ability to conduct site visits.

The following section will highlight the emerging theme - the impact of Malaysian culture on the supplier selection decision-making process.

#### 4.13.2.7 Malaysian Culture

In this section, the impact of the Malaysian culture on the supplier selection decision-making process will be discussed.

The main influence identified for Case E would be the referral of suppliers from family or friends. This section shows how suppliers are located and one of the main sourcing methods identified was word of mouth by family and friends. The interviewee states that the reason for this is due to their experiences with suppliers, so these methods can be trusted.

The interviewee states:

---

*I think most supplier is introduced by my friend. Because supplier is my friends, so they already have experience, so they just introduce to us.*

---

To conclude, the main findings for the following areas are highlighted: the company background, the supplier selection process, how suppliers are sourced or located, the most pertinent supplier selection criteria, the decision-makers, problems and issues existing with the current supplier selection process, protocols and procedures and the emerging theme - the effect of the Malaysian culture on the supplier selection decision-making process.

The following section of the case, will present the main findings for the presence and usage of Information Technology tools for Case E.

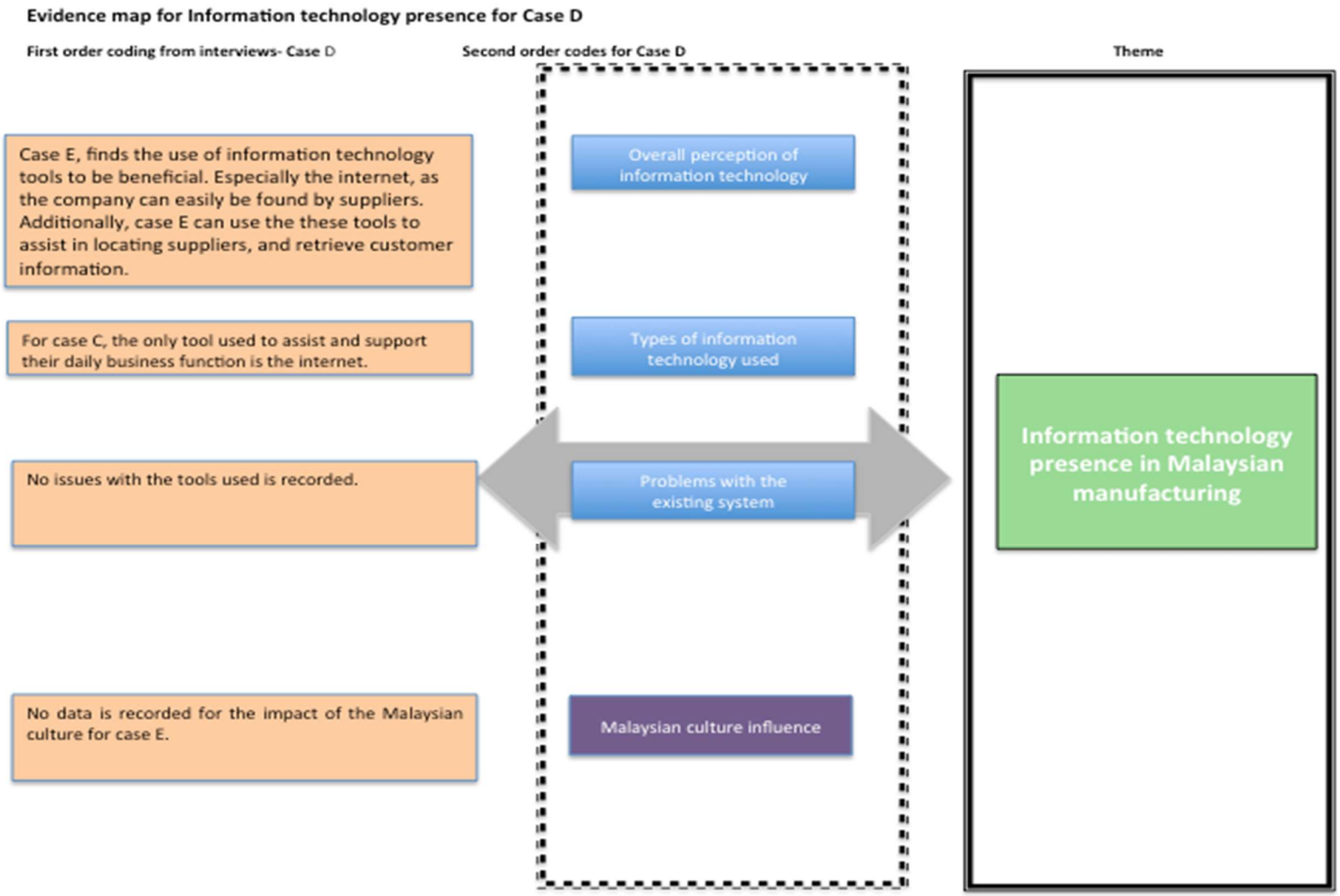



*Figure 4.29 The above evidence map shows the evidence map for the Information technology presence in Malaysian manufacturing.*

### 4.14.1 Information Technology Presence for Case E

In this section, the presence and usage of Information Technology for Case E will be highlighted, including the overall perception of the use of Information Technology, the types of Information Technology tools, problems with the existing system and the impact of the Malaysian culture on the usage and presence of Information Technology. The following section will state the overall perspective of Information Technology tools for Case E.

#### 4.14.1.1 Overall Perspective of the Usage and Presence of Information Technology for Case E

In this section, the overall perspective of the usage and presence of information technology tools will be highlighted for Case E.

The interviewee finds the usage of Information Technology tools to be beneficial, especially the use of the Internet, as it allows the company to be sourced from the customer perspective, and the Internet also allows for Case E to source and locate suppliers, although, as previously mentioned, the Internet tools are only used to acquire information about suppliers and the suppliers are contacted directly.

The interviewee explains:

---

*Yes, because our customers sometimes also finds us through the Internet. Not only the supplier, we can source the suppliers, we find suppliers, we can also get customer information through the internet. Its very good.*

---

In this section, the overall perception of the use and presence of Information Technology tools are illustrated. In the following section, the types of Information Technology and tools used by Case E will be stated.

#### 4.14.1.2 Types of Information Technology Tools used by Case E

For case E, the Information Technology tool used is identified as the Internet.

Google.com and Alibaba.com are identified as tools used to support their supplier selection process. These tools are only used to locate and source suppliers, by accessing contact details, and the suppliers are then contacted directly.

The interviewee states that Google, allows Case E, to be viewed by new customers, and allows Case E to source information about products and new suppliers. The interviewee states below:

---

*Yes. Because our customers sometimes also finds us through the Internet. Not only the supplier, we can source the suppliers, we find suppliers, we can also get customer information through the internet. Its very good.*

---

In addition, the interviewee states that Alibaba.com is used to locate or source new suppliers and they are then contacted directly. The interviewee states below:

---

*Interviewee: If you go on to Ali Baba and you find a particular material you need, do you sometimes not contact them through Ali Baba but do you email them separately?*

*Interviewee: We find a supplier from there and we contact them directly.*

---

Alibaba.com can be defined as an online platform that supports global wholesale trade. This company gives suppliers the tools necessary to reach a global audience for their products and helps buyers find products and suppliers quickly and efficiently.

Below, print screens from Alibaba.com's website show the different categories the company trades in, the search and the search function.

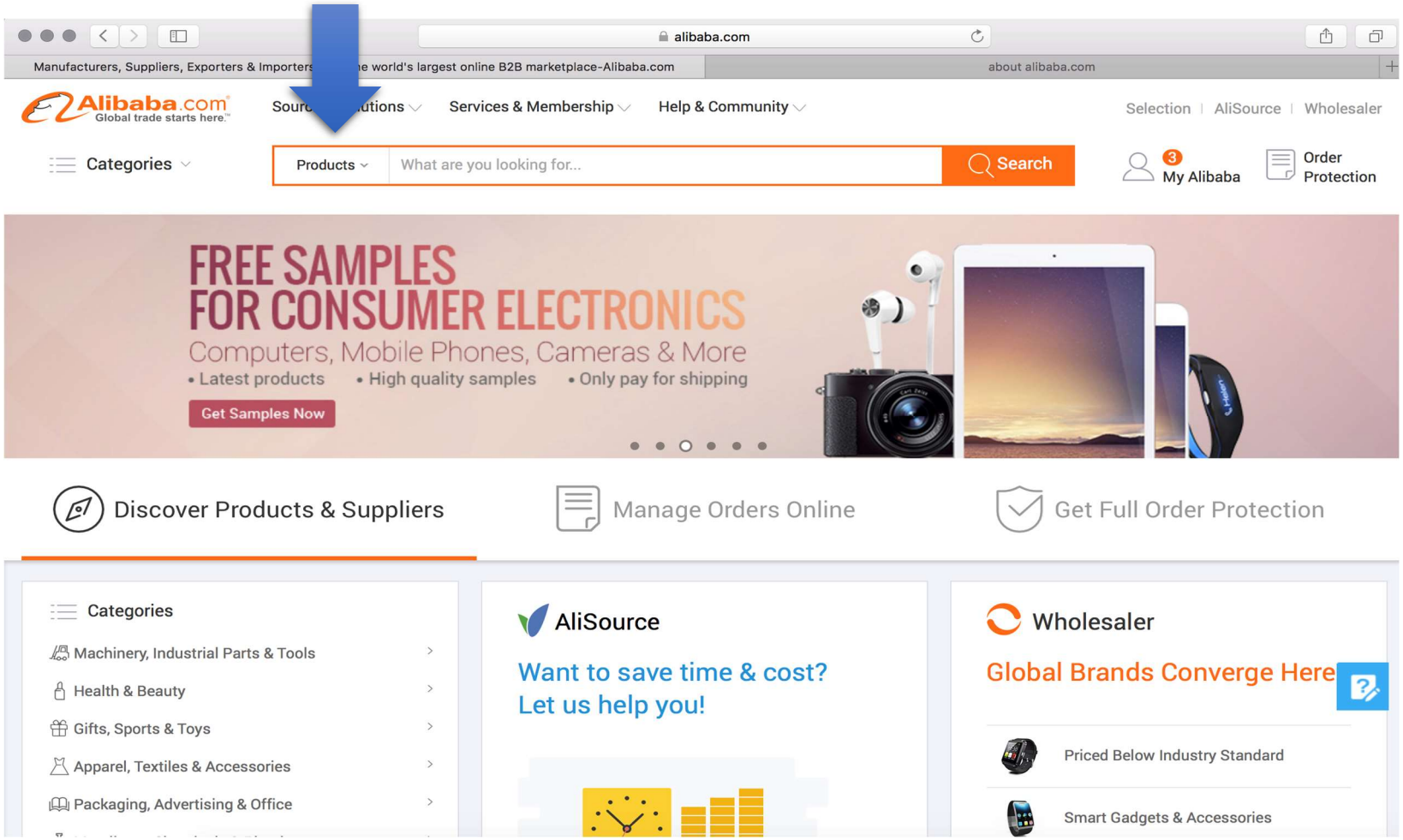



*Figure 4.30 The above print screen shows the search function of Alibaba.com. This image was collected from the company website for the purpose of this research*

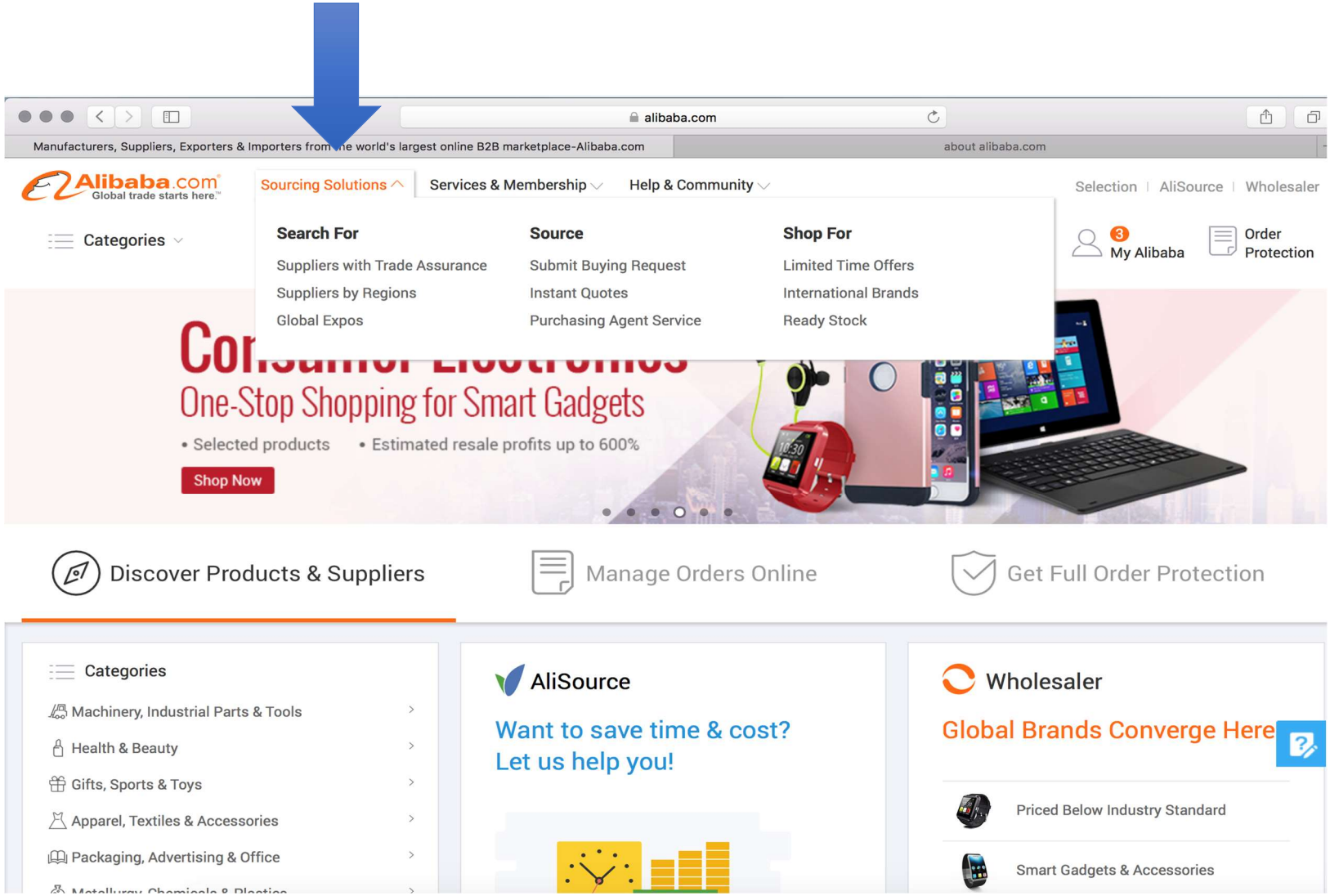



*Figure 4.31 The above image is a print screen from the Alibaba website, and indicates the different types of sourcing solutions available for buyers. This image was sourced from the Alibaba.com's website for the purpose of this research.*

In conclusion to this section, the main tools used to support supplier selection for Case E are identified as the Internet and Alibaba.com. The interviewee states that although the tools are used to source suppliers, the information gathered is used to contact the suppliers directly.

The following section will highlight problems with the existing Information Technology tools.

#### 4.14.1.3 Problems or Issues With the Existing System

Case E did not report any problems or issues with the current Information Technology used.

The following section will report the emerging theme, the effects of the Malaysian culture on the presence and usage of Information Technology tools for Case E.

#### 4.14.1.4 Malaysian Culture Influence on the Usage and Presence of Information Technology Tools

For Case E, there is no data recorded for the Malaysian culture influence on the presence and usage of Information Technology tools.

In conclusion, this section highlights the usage and presence of information technology tools for Case E. This section highlights the overall perspective of Information Technology for Case E, the types of tools used, the problems with the existing system and the emerging theme - the influence of Malaysian culture on the usage and presence of Information Technology for Case E.

The following section will present the usage and presence of Business Intelligence tools for Case E.

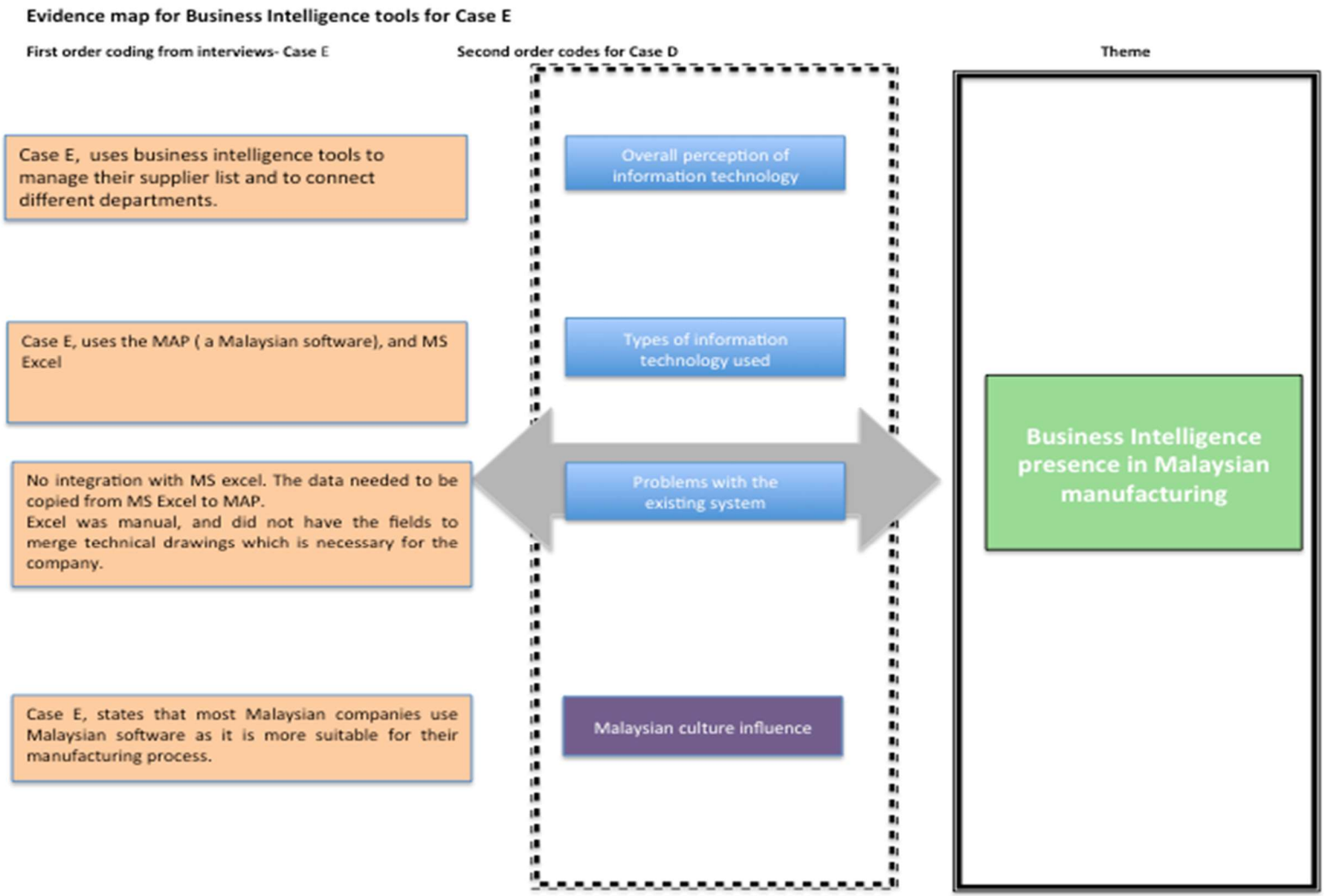



*Figure 4.32 The above evidence map shows the Business Intelligence presence For case E*

### 4.15.1 Business Intelligence Presence for Case E

The following section will present the main findings for the use and presence of Business Intelligence tools for Case E.

This section will highlight the overall perspective for the use of Business Intelligence tools, the types of Business Intelligence tools used by Case E, the problems or issues experienced with these tools and the emerging theme - the effect of the Malaysian culture on Business Intelligence tools.

#### 4.15.1.1The overall Perspective of the Use of Business Intelligence Tools for Case E

For Case E, the overall perspective of the use of Business Intelligence tools is proven to be beneficial. The interviewee states that Business Intelligence tools allow for the company to store, and manage information, in addition to creating reports, and eliminating the manual system that existed previously. Moreover, Business Intelligence tools allow for the integration of all departments within the company with access to view and enter new data.

This section states the overall perspective of the use of Business Intelligence tools for Case E. The following section will highlight the types of tools used by Case E.

#### 4.15.1.2 Types of Business Intelligence Tools Used by Case E

For Case E, Business Intelligence tools are used to support their day-to-day business. Two main Business Intelligence tools are highlighted for this case; these tools include MAP and MS Excel.

## MAP

MAP is a Malaysian made software that is designed for use by the Malaysian manufacturer. A supplier related to Case E recommended this Business Intelligence tool.

The interviewee supports:

---

*Interviewee: We use our own system.*

*Interviewer: Could you tell me what is the name of it?*

*Interviewee: System name is MAP system*

*Interviewer:: And it's Malaysian?*

*Interviewee: It is Malaysian yes.*

*Interviewer: May I ask where did you source it?*

*Interviewee: It is through our supplier. We were recommended through one of our suppliers who also uses this software.*

*Interviewer: Could you tell me what do you input onto this MAP? What do you key in?*

*Interviewee: The supplier request, name, address, what type of business they are doing, what material they can supply.*

*Interviewer: How long have you been using this system?*

*Interviewee: I think around 3 years.*

---

This Business Intelligence also allows for different departments to view and insert information. The interviewee explains below:

---

*Interviewee: All departments can use purchasing, planning, production.*

*Interviewee: 2: Except Finance.*

*Interviewee: Finance also takes from the system and converts it to SQL.*

---

The MAP system also supports the supplier audit process, and produces reports, which have a pie chart function. The interviewee supports:

---

*Interviewee: Yea. Pie chart.*

*Interviewee: so at any point in time do you audit MAP? Let's just say you have been using this system for 3 years. You have how many suppliers on an average?*

*Interviewee: supplier. A lot. I think more than 100, Because we have different types of material and other supplier also a lot.*

---

The interviewee also mentions about data cleansing for the system, where information is updated when the supplier information is changed. The interviewee states:

*Interviewee: Normally if they say supplier they have new product or they have moved to other place, they will inform us, and then we need to update into our system. So they cannot automatic generate, Information must be provided by them.*

*The raw material supplier, we don't audit as we have the mill certificate so we do not need to audit.*

*we sometime we also send others. We also need to keep the relationship. Very important because all of them are our suppliers we still give the order to them but it is very less.*

Another Business Intelligence tool used by Case E is MS Excel and the SQL database function. The interviewee states that the finance department is the only department still using SQL. MS Excel supported Case E before the implementation of MAP. The interviewee also states that there were never any issues with MS Excel, but it was a manual system, and MS Excel used more resources to control and to ensure the data was correct. The interviewee explains below:

*We use excel but it was always manual. We need to do it ourselves. In the other system, we just feed what we wanted it to show then I can link with all departments, so we can see every data in the system.*

*Actually we use the system for us it's easier for controlling. It's not the program, EXCEL never caused the problem to us but everything we must remember.*

*Because we have daily meeting, the think the data is not a big issue. For me based on my opinion, to use my system is easier for us to control. From getting the order to delivery, we know the process. If they say you use the excel, you cannot bring everybody. This is the problem. In our system, you have the ID already can log in to our system and to see*

---

In this section the interviewee states that the two main Business Intelligence tools used are MAP, a Malaysian program designed for the Malaysian manufacture and MS Excel. The following section highlights some of the issues experienced with the current system.

#### 4.15.1.3 Problems or Issues With the Current System

The previous section identifies the Business Intelligence tools used in Case E. This section will highlight the issues or problems experienced with these systems.

For MS Excel the interviewee states there was a lack of integration to MAP, and the data needed to be manually copied to the new system. Additionally, MS Excel did not allow for all departments in the company to be linked. The interviewee states below:

---

*We use excel but it was always manual. We need to do it ourselves. In the other system, we just feed what we wanted it to show then I can link with all departments, so we can see every data in the system.*

*I think we did one by one. We copy from excel.*

---

For MAP, the interviewee did not report any issues with the system. The system allows all departments, besides the finance department to view data in the system. MAP also allows the business intelligence system to automatically perform audits for their non-raw material suppliers, and to monitor the results.

This section highlights the problems and issues experienced with the usage of Business Intelligence tools for Case E. The following section highlights the effect of Malaysian culture on the usage and presence of Business Intelligence tools for Case E.

#### 4.15.1.4 The Influence of the Malaysian Culture on Case E.

In the previous section, the types of tools used by Case E, the interviewee identified a Business Intelligence tool called MAP. MAP is a local software that is designed for the needs of Malaysian manufacturing. MAP's advantage is that the software is also customised for the needs of specific companies and the software is also adaptable to future changes. The interviewee explains further:

---

*MAPS. So that is why most of Malaysian company, use local software because it's not too complicated and more suitable for our manufacturing. Actually they provide the basis; we also need to discuss with them what we want. After using one month we have meeting and we tell them what issue we facing. They will change according to our interest. Sometimes it is designed by our self. They only provide the basis. My system, they can do this blah blah blah. Whenever you use already,*

*you know already, requirement is different. So our manufacturing and the trading company is different right. So we will request them to change. Now we facing this problem. Can you change? Then they will do for you.*

*Yea we request. Just like mobile phone. You can see that in Malaysia, android user is more than apple user. Why? Because apple everything is locked. You cannot change it. You only can use the android. So the homepage I put this one. So they can customize for our needs.*

---

To conclude, this section highlights the influence of Malaysian culture on the presence and usage of Business Intelligence tools. Case E uses Malaysian software that is designed and customised to each manufacturing company they service.

The following section will highlight the Artificial Intelligence presence in Case E.

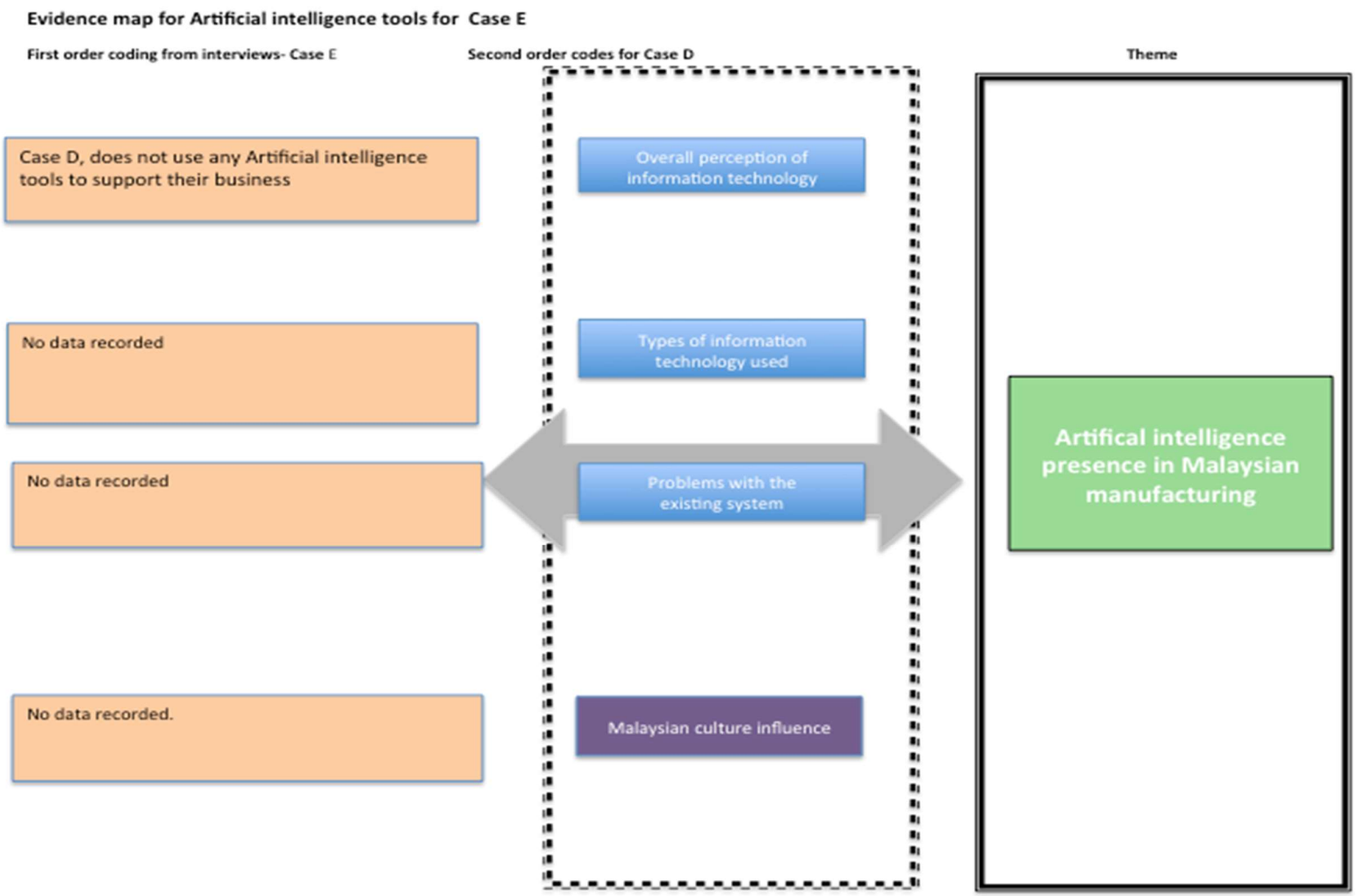



*Figure 4.33 The above figure shows the evidence map for the Artificial Intelligence presence for Case E*

### 4.16.1 Artificial Intelligence Presence for Case E

The above evidence map highlights the findings for the Artificial Intelligence presence for Case E.

As shown above, there is no presence or usage of artificial tools or technologies in Case E.

The interviewee made no mention of this in the interviewing process.

In conclusion, this case study represents the following: supplier selection dimension, supplier selection process, supplier evaluation, how suppliers are sourced and problems and issues in supplier selection. Moreover, it includes Information Technology usage and presence and the presence and usage of Business Intelligence tools, and the presence and usage of Artificial Intelligence tools and technologies. In addition to these, the emerging themes of Malaysian culture has been highlighted.

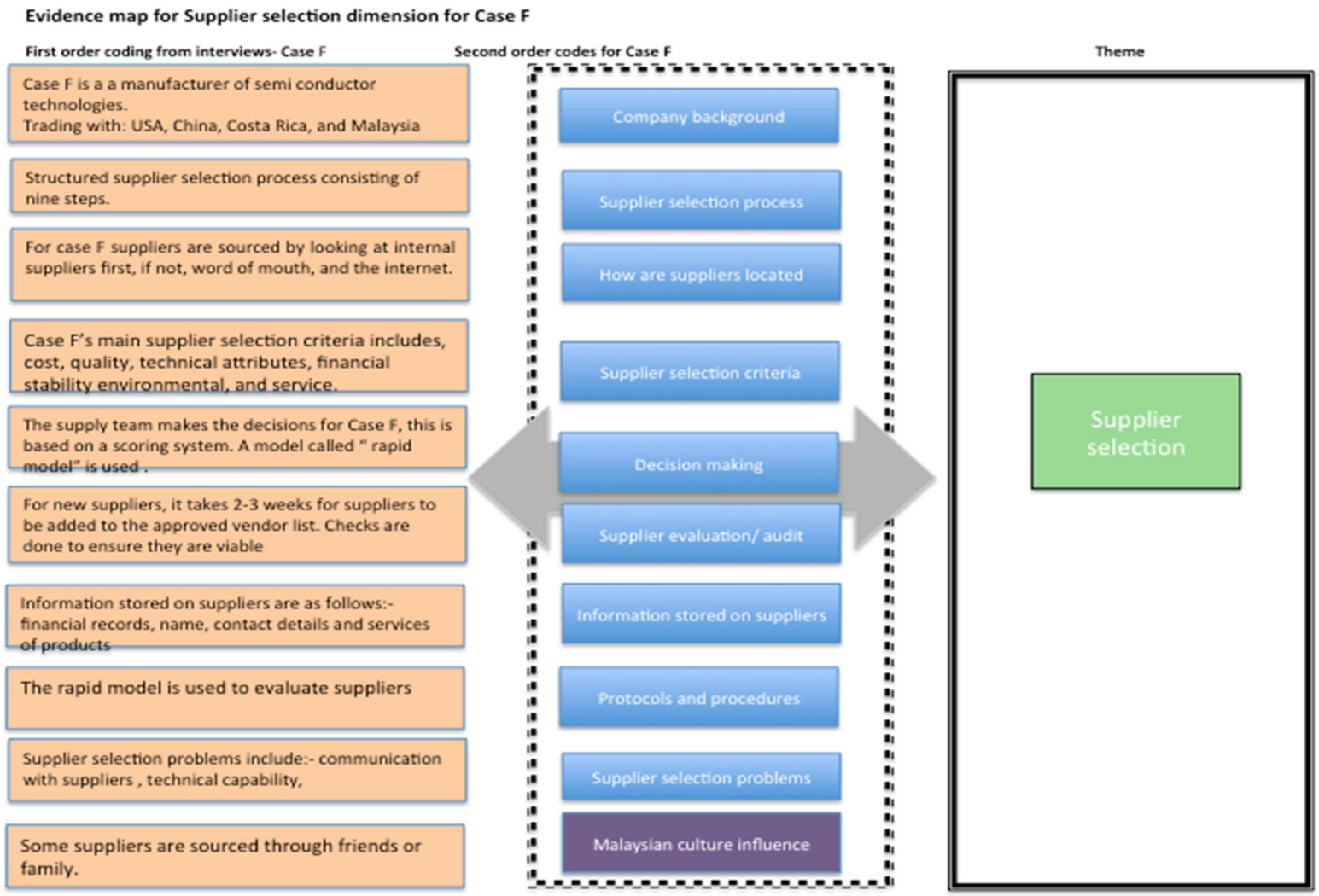



*Figure 4.34 The above evidence map shows the Supplier selection decision making process for Case F*

## 4.17 Case Study F

The above evidence map presents the main findings for the supplier selection dimension for Case F. This section will highlight the main findings for the company background, the countries with whom Case F trades with, their supplier selection process, how are their suppliers sourced or located, their main supplier selection criteria, who the decision makers are, their supplier evaluation or audit process, information stored on suppliers, protocols or procedures used to support their supplier selection process, supplier selection problems or issues and the emerging theme, the impact on Malaysian culture on the supplier selection decision-making process.

The following section will describe the company background and the countries they trade with.

### 4.17.1 Company Background

Case F is defined as a world leading manufacturer in technology and communication products. Case F trades with the following countries, United States of America (USA), Costa Rica and Asian countries. The interviewee states below:

---

*World leading on the manufacture on the computer networking and communication product. And right now if you really know about Intel right now we are also marching towards on the mobiles. I mean mobile view. So from that you can see that this company we have the semi- conductor memory product, so from there, you know. How do I say this, Because of this we have all this computer,*

*notebook and several others… So we also involving our many different processors on the different country location, ok.*

*we have world wide. You can see you know if you asking me where intel located, I think we have whole world wide like we have Intel Arizona, Intel Costa Rica, probably Costa Rica at this moment because of what happened last year because the production operation have been closed down already. And we have Asian, we have Intel Chengdu.*

*All these site I mention to you is more on the production side which is assembly test area. And besides that we have Intel Shanghai, Intel Singapore Intel UK, Ireland, more of these countries probably in the sales and marketing.*

---

As indicated from the above quotes, Case F manufactures computer networking and communication products and trades globally with different countries. The following section will present the main findings on their supplier selection decision-making process.

### 4.17.2 Supplier Selection Process

This section highlights and explains the supplier selection decision-making process for Case F.

The below diagram, represents the process that is followed to select a new supplier.

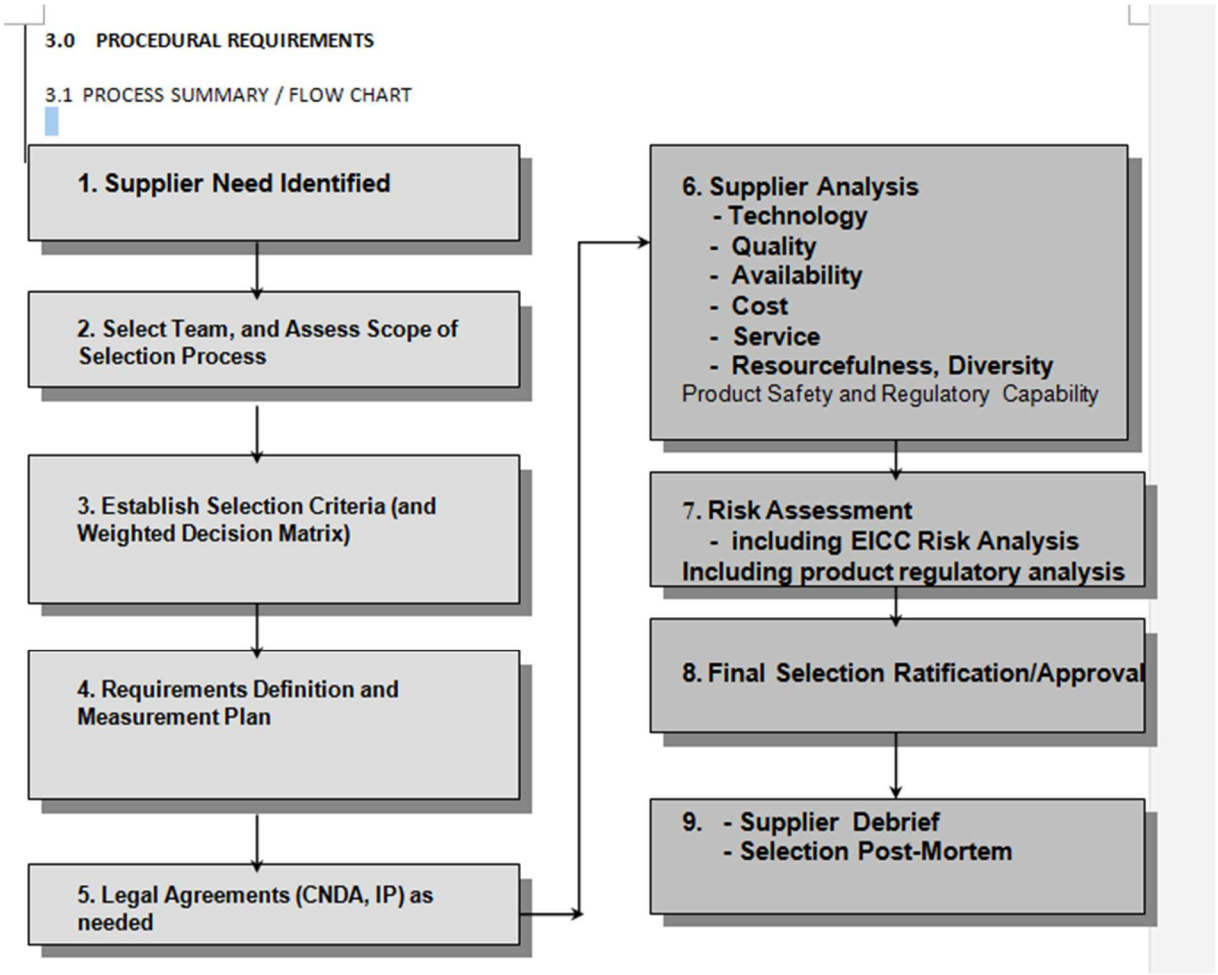



*Figure 4.35 Case F's Supplier selection decision-making stages.*

The above figure 4.35 shows the nine (9) stages that are followed by Case F, when selecting a new supplier.

The interviewee explains further:

### Stage 1: Supplier Need Identified

The first of the nine stages is known as “supplier need identified”.

---

*ok., we do have a supply selection step. Total, we have nine step to go for it. Every time when we have a supply selection, a full blown supply selection, we need to identify the nine steps. First of all, the first step is we need to have the supply need identified.*

---

This stage is an acknowledgement to the supplier team that there is a need for a product or service.

### Stage 2: Select Team and Assess the Scope of Selection Process

At this stage, a member of the selection team is identified to perform the supplier selection decision-making.

---

*Second, we need to form a supplier selection team member.*

---

A member of the selection team is defined from the interviewee as a person from the supply team.

---

*I think this is one of the questions whether the selection decision will be from, from which member. So I think from that, I just want to answer you, supply selection team member will include;*

---

### Stage 3: Establish Selection Criteria (and Weighted Decision Matrix)

At this stage, the supply team member assesses the internal and the external environment, this entails performing a SWOT analysis (strengths, weakness, opportunities and threats).

---

*So the third step is to assess the internal and external environment.*

*I will say that when we assess the internal and external environment using the SWOT or we are adding…you also mentioned B. I. B. I. is also part of that, the Business Intelligence. So from that, the Business Intelligence you are able to know how is the market on this particular product. So how is the situation look like. Ok?*

---

### Stage 4: Requirements Definition and Measurement Plan

At this stage, the supply team member will define the need of the product or service from the supplier.

The interviewee gives an example:

---

*After that when we performing the third step, we go back to the defined requirement. We need to know what is our spec. like for example, we would like to have a selection on gloves, just an example, so from that we need to know about this nitro glove, what is our spec. the sizes, the strengthener, when we go for etc. All the spec will be defined.*

---

### Stage 5: Legal Agreements (CDNA, IP) as Needed

At this stage, all legal agreements which pertains to the supplier and Case F is identified.

CDNA is identified as two of the main legal agreements for Case F.

---

*Then the number five step is we need to issue some CNDA, which is the Confidential Non-Disclosure Agreement. We need to have the supply shortlisted to sign on the CNDA. Whatever type of selection is confidential is not able to be disclosed to the other body. OK?*

---

The CDNA (Confidential non-disclosure agreement is a legal document signed by the shortlisted supplier, to uphold confidentiality between Case F and the supplier.

### Stage 6: Supplier Analysis

At this stage, the new supplier evaluation and selection is performed, using the main supplier selection criteria: technology, quality, availability, cost, service, resourcefulness, diversity, product safety and regulatory capability is also taken into consideration.

---

*Number six step, we have a supply evaluation and selection. So the evaluation will be including a lot of the activity, such as we may gather the input, visit the supplier, understand what the supplier production is, the location where they are. So from that, the supply selection team will become all the metrics, what is the metric you would want to look at. Probably, I think various kind in our company Intel*

*Technology will be looking to see what; which is cost, quality, technology, service, and financial...*

---

The interviewee explains that at this stage, Case F gets an overview of the supplier, by conducting site visits, and also by looking and their financial stability.

---

*Yes. So we always did a CQAT. 'C' stands for Cost, 'Q' stands for Quality, 'A' actually is Call Availability, 'T' is Technology. So availability can be part of the service and also financial stability.*

---

### Stage 7: Risk Assessment

At this step, a risk assessment is conducted on the supplier. The figure 4.35, identifies the type of risk analysis performed is an EICC. Electronic Industry Citizen Coalition is a risk assessment tool that is used in the first step of supplier selection. This tool evaluates individual supplier risks including labour, health and safety, ethics and environmental risks.

The following document provided by the interviewee explains further:

# EICC Risk Assessment Tool – Introduction and instructions

## What is the EICC Risk Assessment Tool?

EICC and Verisk Maplecroft are excited to launch a new, powerful tool to support EICC members in their supply chain risk assessment process. The Risk Assessment Tool links Verisk Maplecroft's Global Risk Portfolio to the EICC Code of Conduct, allowing members to quickly and easily access a high-level risk assessment of EICC code-related risks for their entire supply chain.

The tool is intended to be used as a first step in the EICC risk assessment process, and should be complemented by use of the EICC Self-Assessment Questionnaire (SAQ for 80% of tier 1 manufacturing supplier spend) and VAP audits (where necessary). For more information, see EICC Member Compliance responsibilities. The EICC Risk Assessment Tool allows users to:

- *Evaluate individual supplier risk* across key pillars, including labour, health and safety, ethics, and environmental risks through the supplier list view, using a scale of 0-10 for all risks (where 0 indicates the highest risk)
- *Identify where to prioritise mitigation strategies* by filtering and sorting supplier data to determine which suppliers should be targeted for SAQs, audits, and other remedial measures
- *Compare individual issues and supplier sites* to strategically evaluate (a) what sites are high risk and (b) the implications of switching / diversifying to new or other existing suppliers

## How do I access the tool?

The Risk Assessment Tool is made available to all EICC members through the 'Apps' menu in EICC-On at https://www.eicc-on.info (Figure 1).

Through the EICC-on platform, you will be able to register with Verisk Maplecroft and link directly to the tool dashboard (Figure 2).

*Figure 1:* To access the Risk Assessment Tool, select Verisk Maplecroft in the 'Apps' drop down menu in EICC-On.

*Figure 2:* Once logged in to Verisk Maplecroft, you will be taken directly to the Risk Assessment Tool dashboard.

## What are the main functions of the tool, and how do I use them?

The **dashboard** allows easy navigation to the complete range of modules within the tool, including:

1. **Risk lists for all suppliers:** sortable list of all suppliers and risk assessment scores according to country, product/service, and risk level (Figure 3). Data presented in the supplier list view is available to export as comma-separated values (CSV) to Microsoft Excel for further internal analysis.

*Figure 3:* The supplier list view allows users to sort / filter supplier data to identify high risk suppliers across pillars

From the risk list, individual supplier scorecards are accessed (Figure 4). In-depth information presented in the scorecards includes: a comprehensive risk scorecard with 4 pillar indices; corresponding risk maps for all pillars; benchmarking against other sites by country and industry; and related Global Risks Forecast articles and Stakeholder Views.

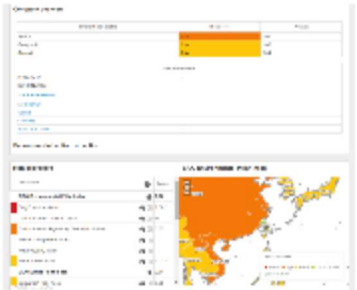


*Figure 4:* Access individual supplier scorecards for in-depth risk information

Figure 4.35.1 A print screen of the Risk Assessment tool used by Case F

### Stage 8: Final Selection Ratification/ Approval

At this stage, a final decision is made regarding the supplier, either to approve or disapprove.

### Stage 9: Supplier Debrief

At this stage the supplier is informed of the decision and matters of concerns will be discussed.

In this section, the supplier selection decision-making process is discussed. Case F follows a nine (9)-stage procedure before selecting or disapproving a supplier. In the following section, how suppliers are sourced or located by Case F will be highlighted.

#### 4.17.2.1 How Suppliers are Sourced or Located

In this section, how Case F sources or locates their suppliers will be discussed. The interviewee states that for most of their products, there are many approved suppliers on their approved supplier lists. The approved supplier list for Case F is referred to as 'internal suppliers'. These suppliers have already gone through the nine stages discussed in the supplier selection process section.

The interviewee explains further:

> *OK, first of all, we will look at our incumbent supplier, which is our current supply database. We may have a different supplier. No, I think I will say that we have many suppliers, some of the suppliers they have the same capabilities. First of all, we look at our incumbent supplier which is our internal suppliers, whether we have the same capability supplier then we shortlist them out.*

In some cases, where a product or service is required and an internal supplier is not able to provide these services or products, the supplier team uses the internet, and word of mouth to source new suppliers. The interviewee explains:

### Internet

> *Sometime we also use some, like, I think Google search is very simple but when you search it, when you ask me where is the location. So that would depend on when you conducting a supply selection, what product you are looking at.*

### Word of Mouth

> *Mhmm, like sometimes we go back to the other SME to source it when we go to that area, they are able to list out all companies that have been registered with them; so who are they, what category, what is the major business they are. so from that we are able to filter out which is the supply we are looking at.*

This section highlights the methods used by Case F to source or locate new suppliers.

As Case F already has many suppliers who supply them with their required services and products, they look to their internal supplier list. In some cases, the internal suppliers are unable to provide the required services, Case F utilises the Internet and advice from other businesses. The following section will discuss the main supplier selection criteria used by Case F.

#### 4.17.2.2 Supplier selection criteria

In this section, the most pertinent supplier selection criteria used by Case F, for the supplier selection process will be identified.

Previously, in the supplier selection process section 5.13.2, the most pertinent supplier selection criteria is highlighted in the nine steps followed to select a supplier.

In the previous section 5.17.2, the interviewee presents a nine-step flowchart of the process. The seventh step, presents the main supplier selection criteria that is assessed. At this step, a weighting system is conducted to assess each new supplier.

The below figure presents scoring matrix for the criteria that is assessed and the maximum score that can be achieved by each new supplier.

The interviewee states: -

---

*we have a scoring based on the category or the criteria and first of all before the supply selection, each category or each criteria we need to have a weightage score their already like example, we looking on cost, we say that for example, we put on cost as 25 mark, quality 25 mark, ability 50 mark, technology 20 mark, services 50 mark and 100 mark. So from then I have each category I have assembled all the detail so from that the team will give a scoring. So when we give all this scoring then we will score and compare which is the highest score and what we want to look at then the team will make a decision.*

---

| Category | Weightage |
|---|---|
| Cost | 25 |
| Quality | 25 |
| Availability | 15 |
| Technology | 20 |
| Services (Inl Finance) | 15 |
| Total | 100 |

*Table 4.2 This table was provided by the interviewee, showing the maximum weighting for each supplier selection criteria.*

### *Technology*

Technological attributes are confirmed by Case F as a main supplier selection criteria. As mentioned in the supplier selection process section 5.17.2, technology is identified as one of the main attributes in selecting a supplier. Also as indicated in the above table 4.2, the maximum percentage that can be rated on the weighting matrix is 20.

The interviewee states below-

> *Yes. So we always did a CQAT. 'C' stands for Cost, 'Q' stands for Quality, 'A' actually is Call Availability, 'T' is Technology.*

### *Quality*

Another pertinent supplier selection criteria identified by the interviewee is quality.

Quality is mentioned as one of the main supplier selection criteria under the supplier assessment analysis as shown in the supplier selection decision making process. Quality is seen as one of the criteria that determines the cost of materials for Case F, without compromising the quality of the material. Additionally, quality is presented as one of the more pertinent criteria due to the maximum score that can be achieved by the weighting matrix as stated in the above table 4.2.

The interviewee explains further-

---

*I want to be having a good quality and technology, my cost will be increase ready so when you do a scoring on the unclear on the supply selection your cost will be low down already, then you put more score in the quality and technology.*

*Although your price is cheaper, but I'm looking on your technology and quality*

---

### *Availability*

Availability has also been identified as another main criterion for supplier selection for case F. Availability is also mentioned as a criterion that is scored under the supplier selection assessment process for case F.

Availability in this case means the ease of access of materials for case F.

The interviewee states that availability also contributes to financial stability and service.

Additionally, this criterion can achieve a maximum of 15 percent on the weighting matrix as shown in the above table 4.2.

The interviewee supports:

---

*So we always did a CQAT. 'C' stands for Cost, 'Q' stands for Quality, 'A' actually is Call Availability, 'T' is Technology. So availability can be part of the service and also financial stability.*

---

### *Cost*

Cost is highlighted as a pertinent supplier selection criteria as reflected in the supplier selection decision making process, and as indicated in the weighting matrix table 4.2 as stated above. The maximum percentage that can be achieved by a supplier for cost is 25. Cost is one of the criteria that is ranked with the highest maximum score for Case F.

The interviewee states-

---

*So we always did a CQAT. 'C' stands for Cost, 'Q' stands for Quality, 'A' actually is Call Availability, 'T' is Technology. So availability can be part of the service and also financial stability.*

*But, you can use the standard category like what I mentioned just now like cost, quality, availability, technology and services, from that you can evaluate the cost I*

*think the cost is pretty simple, I just want to have a right cost, but sometimes your supply selection, your selection, your cost, your unclear can be lower score because you know that hey, this item you want to have a very good quality and good technology definitely my cost was not my focus already because I want to be having a good quality and technology, my cost will be increase ready so when you do a scoring on the unclear on the supply selection your cost will be low down already, then you put more score in the quality and technology. You get what I mean? So from then you know, like, you can use all this category CQAT for you to define*

---

### *Service*

Service is highlighted as a pertinent supplier selection criteria as reflected in the supplier selection decision making process, and as indicated in the weighting matrix table 4.2 as stated above. The maximum percentage that can be achieved by a supplier for cost is 15.

Service has been highlighted as one of the criteria that is important to case F. The interviewee states-

---

*this is one of the criteria, we want to say that hey, I need to ensure that you have that particular technology or service,*

*But, you can use the standard category like what I mentioned just now like cost, quality, availability, technology and services*

---

### *Resourcefulness and Diversity*

Although, resourcefulness and diversity is stated under the supplier selection decision making process for case F, no data was recorded for this criterion. Additionally, this criterion is not mentioned in the weighting matrix as shown in the above table 4.2.

### *Financial stability*

Financial stability has been identified as another main criterion that is identified by Case F. As indicated in the weighting matrix, financial stability is included under service. This criterion is important to Case F, as it prevents them from engaging with a company that is high risk or one that is going bankrupt, also mentioned by the interviewee, a company that is too dependent on Case F. The interviewee explains further-

---

*we don't want to be engaging one of the company in high risk or is going to bankruptcy or they're too dependent, the high dependency, dependency is very interesting topic. You see, today in Intel will engage you, maybe the supply they don't have the customers based they only depends on Intel. So let's say today Intel business decision change suddenly we put the decision that we don't want to order from you we would like to stop this project, then the supplier can be bankrupt anytime or you know, that company will stop all the operations they don't have the business from Intel. So if their true dependency on Intel, Intel also not consider them. They're not part of the short list at least.*

*Yes. So we always did a CQAT. 'C' stands for Cost, 'Q' stands for Quality, 'A' actually is Call Availability, 'T' is Technology. So availability can be part of the service and also financial stability.*

---

This section focused on the main supplier selection criteria that is most pertinent to case F. Case F, presents a weighting matrix that scores each supplier to different supplier selection criteria. The following section will highlight the decision makers for Case F.

#### 4.17.2.3 Decision making

For case F, the supplier selection decisions are made through a supply team. When a need for a new supplier is identified, a member of the supply team is selected to conduct the seven steps of supplier selection decision making as presented in section 5.17.2.

The interviewee states below-

---

*A supply team member. Because we have a scoring, we have a scoring based on the category or the criteria and first of all before the supply selection, each category or each criteria we need to have a weightage score their already like example, we looking on cost, we say that for example, we put on cost as 25 mark, quality 25 mark, ability 50 mark, technology 20 mark, services 50 mark and 100 mark. So from then I have each category I have assembled all the detail so from that the team will give a scoring. So when we give all this scoring then we will score and compare*

*which is the highest score and what we want to look at then the team will make a decision.*

---

This section presents the decision makers for case F. A member of the supply team is assigned to make supplier decisions after processes are conducted. The following section will present the findings for the supplier evaluation or auditing process for Case F.

#### 4.17.2.4 Supplier evaluation or auditing process

For case F, no supplier auditing process is conducted, however, suppliers are evaluated when a new supplier need is identified as discussed in the supplier selection decision making process (section 5.1.7.2).

The following section will present the findings for the information that is stored on suppliers.

#### 4.17.2.5 Information stored on suppliers

For Case F, the interviewee states the information stored on suppliers are as follows: - financial records, name, contact details, list of services and products and their scores from the supplier selection decision making process.

In the following section the protocols and procedures followed by Case F will be highlighted.

#### 4.17.2.6 Protocols and procedures

For case F, the rapid model has been identified as one of the procedures and protocols used for the supplier selection decision making.

The rapid model is explained by the interviewee as a method used by the company to support their supplier selection decision making. This model assists by identifying decision making problems and how key decisions should be make going forward.

The rapid model stands for: -

Recommend:

- Making a proposal on a key decision, gathering input, and providing data and analysis to make a sensible choice, in a timely fashion.
- Consulting with input providers – hearing and incorporating their views, and winning their buy-in.

Agree:

- Negotiating a modified proposal with the one who recommends if they have changes or concerns to the original proposal.
- Escalating unresolved differences and issues to the decider if A and R cannot resolve their differences.
- If necessary, exercising veto power over the recommendation.

Perform:

- Executing a decision once it's made.
- Seeing that the decision is implemented properly and effectively.

Input:

- Providing relevant facts to the one who recommends that shed light on the proposal's feasibility and practical implications.

Decide:

- Serving as the single point of accountability.
- Bringing the decision to closure by resolving any impasse in the decision-making process.
- Committing the organization to implementing the decision.

https://thesavvystrategist.com/2010/11/27/making-critical-decisions-the-r-a-p-i-d-1-way/

The interviewee explains further: -

---

*But I just want to add on one information to you, just you asked me a question who make the decision I'm right? I say that it's the supply selection team member, whole team member to make a selection. But I just want to add on one thing: actually we're using one model is called rapid model.*

*Yes. Like we're using who are the role playing on the recommend, like who playing a role on the agreed, who playing a role onto performing, who playing a role on input, and who are the designed. Rapid model.*

*That is a rapid model. If you go to the, I think you are able to find this information from Google, you put there rapid decision model and you're able to see the few charts sharing all that. So from that, you know, when we have a form of team*

*Then we have a like, selection team member, the team lead, let's say he is a team lead, then you are in the role, playing the role of art. You get what I mean?*

*So for that, that model will be help in case like you know, sometimes in the team discussion you are not able to get a decision.*

*So we are using that rapid model has been defined to say that when we come to that decision who are the D? Decision.*

---

In this section, a procedure to assist the supplier selection decision making has been identified as the RAPID Model.

This procedure is used when the supply member is having difficulties in assessing a new supplier. The following section highlights the issues or problems experienced in the supplier selection decision making process.

#### 4.17.2.7 Problems or issues experienced in the supplier selection process

For Case F, due to their structured process throughout the supplier selection decision making process and the execution of procedures and protocols, many problems and issues have been eliminated for case F. However, some issues have been identified in some instances.

***Internal communication***

For case F, internal communication exists as an issue, this also includes training of each staff member. Although there are procedures to be followed, the issues lie in achieving the objectives of supplier selection through staff.

The interviewee explains further: -

---

*But I think personally because I'm leading a couple supplies selections, every time you know, when I'm leading the supply selection when I form the team, first of all I do internal team communication, tell them you need to make sure that attend the supply selection classes, understanding all the steps, what you need to do, and*

*what you should do and the don'ts, so from then I would tell them that you know, today what is the problems tell me what we have now and what we want to be achieving of the objectives to have this supply selection, where we are now, so from then have all this alignment, so I will always say that the alignment, the communication alignment, is very important we cannot say hey your are the A, B and C then we have a D*

---

In this section, the interviewee highlights and issue that sometimes exist with case F. Most of their issues and/or problems have been eliminated due to their processes and protocols, however, there still exists internal communication issues that could be eliminated with staff training.

The following section will highlight the emerging theme for the supplier selection decision making.

#### 4.17.2.8 Malaysian culture impact

For case F, one of the main issues identified by the interviewee for the impact of the Malaysian culture, would be the suppliers being sourced through family and friends.

Previously mentioned in the how are suppliers sourced or located section 5.17.2.1, the interviewee highlights that in some cases, the word of mouth method is used to source some of their suppliers. In some cases, the supplier recommendation from other

companies are of the family and friend of nature. Moreover, for the employees of Case F, are not prohibited to select a family or friends or any relation to the employee.

The interviewee explains further: -

---

*Like sometimes we go back to the SME to source it when we go to that area, they are able to list out all companies that have been registered with them; so who are they, what category, what is the major business they are. so from that we are able to filter out which is the supply we are looking at.*

*you know one thing is, you know, in our company we have a policy, when you in the supply selection team, every supply selection team member need to file a declaration form, make sure all short listed suppliers you don't have a share there, you don't have the relationship there, you're not, your cousin, or your boyfriend, your girlfriend, or your father, your aunty, uncle business we need to sign all this forms.*

---

In this section, the findings for the supplier selection dimension was presented. The following topics were highlighted; company background, the supplier selection process, how are suppliers sourced or located, the pertinent supplier selection criteria, who are the decision makers, the supplier evaluation and auditing process, what information is stored for each supplier, protocols and procedures used to support the supplier selection decision making process, supplier selection problems or issues, and the impact of the Malaysian culture on the supplier selection decision making process.

The following section of this case study will present the main findings for the presence and usage of information technology tools for Case F.

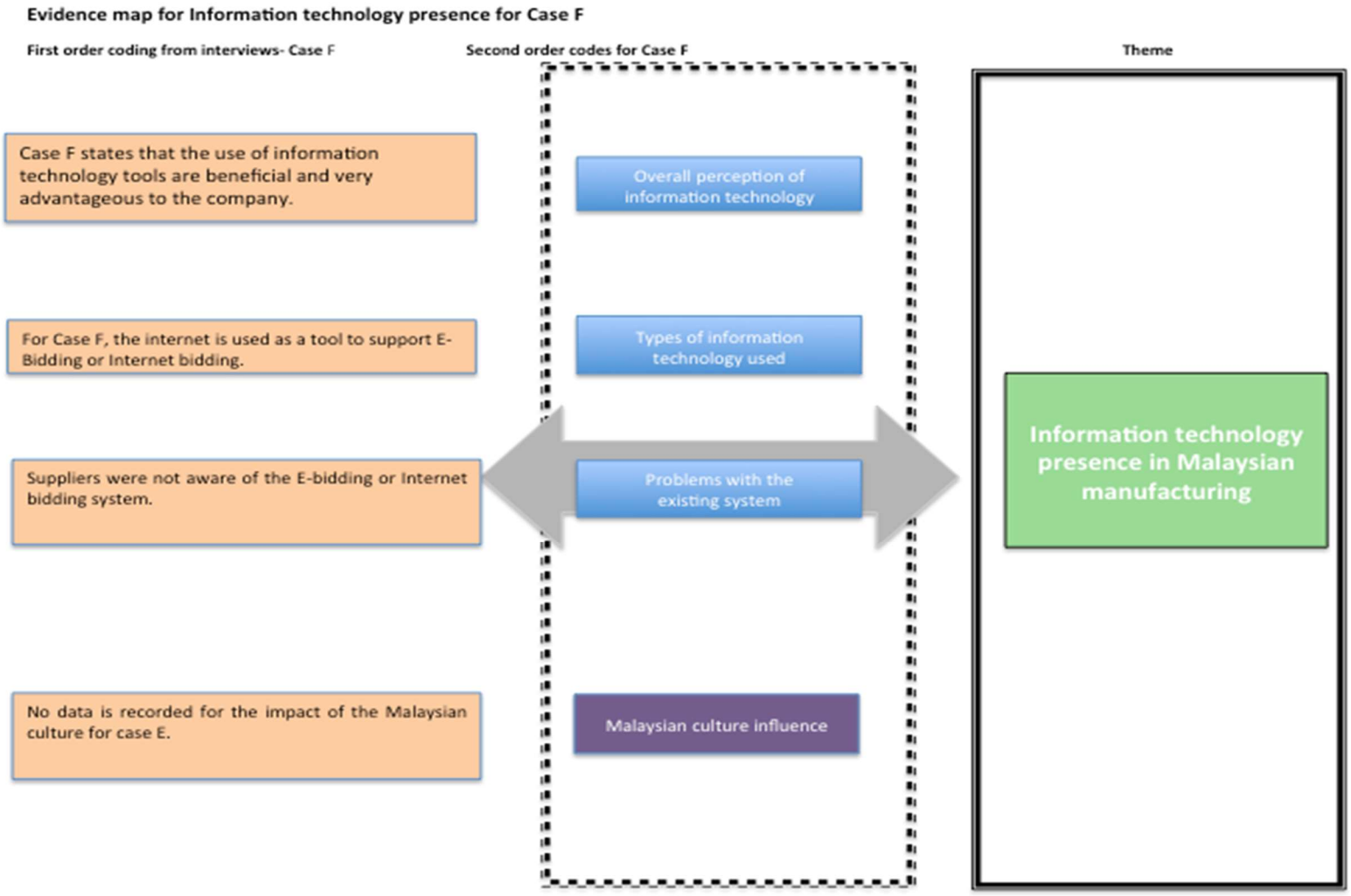



*Figure 4.36 The above evidence map shows the Information technology presence for Case F*

### 4.18.1 Information technology presence for Case F

This section will present the main findings for the presence and usage of information technology tools for Case F. In this section, the following areas will be highlighted; the overall perception of the use of information technology tools, the types of information technology tools used and the emerging theme, the impact of the Malaysian culture on the use of information technology tools in case F.

The following chapter will highlight the overall presence of information technology tools in Case F.

#### 4.18.1.1 Overall perception of the presence and usage of information technology tools for case F

For Case F, the use and presence of information technology tools is viewed as being both beneficial and advantageous. Information technology tools supports the supply team of case F in the supplier selection decision making process.

The interviewee states below: -

> *Yes. It's a very advantage to us*

This section highlights the overall perspective of the use of information technology tools for case F. The following section will present the types of information technology tools used to support the supplier selection decision making process for Case F.

#### 4.18.1.2 Types of information technology tools used

In the above section 5.18.1.1, the interviewee states that the use and presence of information technology tools are beneficial and advantageous to case F. This section will present the tools used by Case F to support their supplier selection decision making process.

***Internet bidding or E- Bidding***

For case F, internet bidding or E-Bidding, is highlighted as the tool used to support the supplier selection decision making.

Internet bidding or E bidding is explained by the interviewee as a different form of supplier selection, the process of is conducted similarly to the steps described in the supplier selection decision making process, but in this case, suppliers will be bidding against each other to obtain a spot in the approved supplier list. Suppliers are given log in details to the company website, a date and a time that the bidding will commence.

The interviewee explains further: -

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*Yes. It's a very advantage to us. And you can see that, I just want to share it, in Intel we have internet negotiation. We have internet bidding.*

*in the past few years actually we have conducted internet negotiation so mean to say that it's some sort of supply selection it's the same thing we are using the same nine step but when they're bidding they will go into the, like, bidding system, like, we tell them when is the date of the bidding, and what product we want to look at this is the total volume for the part … so these products they will bidding the pricing so we tell them this bidding is take you above 45 minutes or 1 hour then they will go into bid ready.*

---

This section presents one of the information technology tools used by Case F to support their supplier selection decision making process. In the following section, problems or issues experienced by case F will be discussed.

#### 4.18.1.3 Problems or issues experienced

In the previous section 5.18.1.12, internet bidding or E- bidding was identified as an information technology tool used by Case F to support their supplier selection decision making process. However, this process has been stopped due to certain constraints. In most cases, some suppliers did not have the adequate knowledge to operate the E-Bidding system, and another result of this is the input of incorrect data by the supplier.

The interviewee explains: -

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*we stopped this for a couple of years the reason why, because of, you know, some suppliers they do not know, they don't have that knowledge to operate on that, because of when you do the bidding you need to be very fast to enter the pricing, you need to make sure that your system set up should be very fast so some of the suppliers come back to tell us and say oh at the time my wireless went out so that's why I'm not able to bid because at the time I don't understand your bid on that product .. so I quote the wrong price.*

*They don't know how to use the tools, then they don't understand that when you're bidding you need to be very fast then they say after the entry the keyboard is not function.*

---

This section highlights the main problems and issues with the use of information technology for case F. The following section will report the emerging theme, the impact of the Malaysian culture on the use of information technology for Case F.

#### 4.18.1.4 The Impact of the Malaysian Culture

For Case F, there is no data recorded for the Malaysian culture influence on the presence and usage of Information Technology tools.

In conclusion, this section highlights the usage and presence of Information Technology tools for Case F. This section highlights the overall perspective of Information Technology for Case F, the types of tools used, the problems with the existing system and the emerging theme, the influence of Malaysian culture on the usage and presence of Information Technology for Case F.

The following section will present the findings for the use and presence of Business Intelligence tools for Case F.

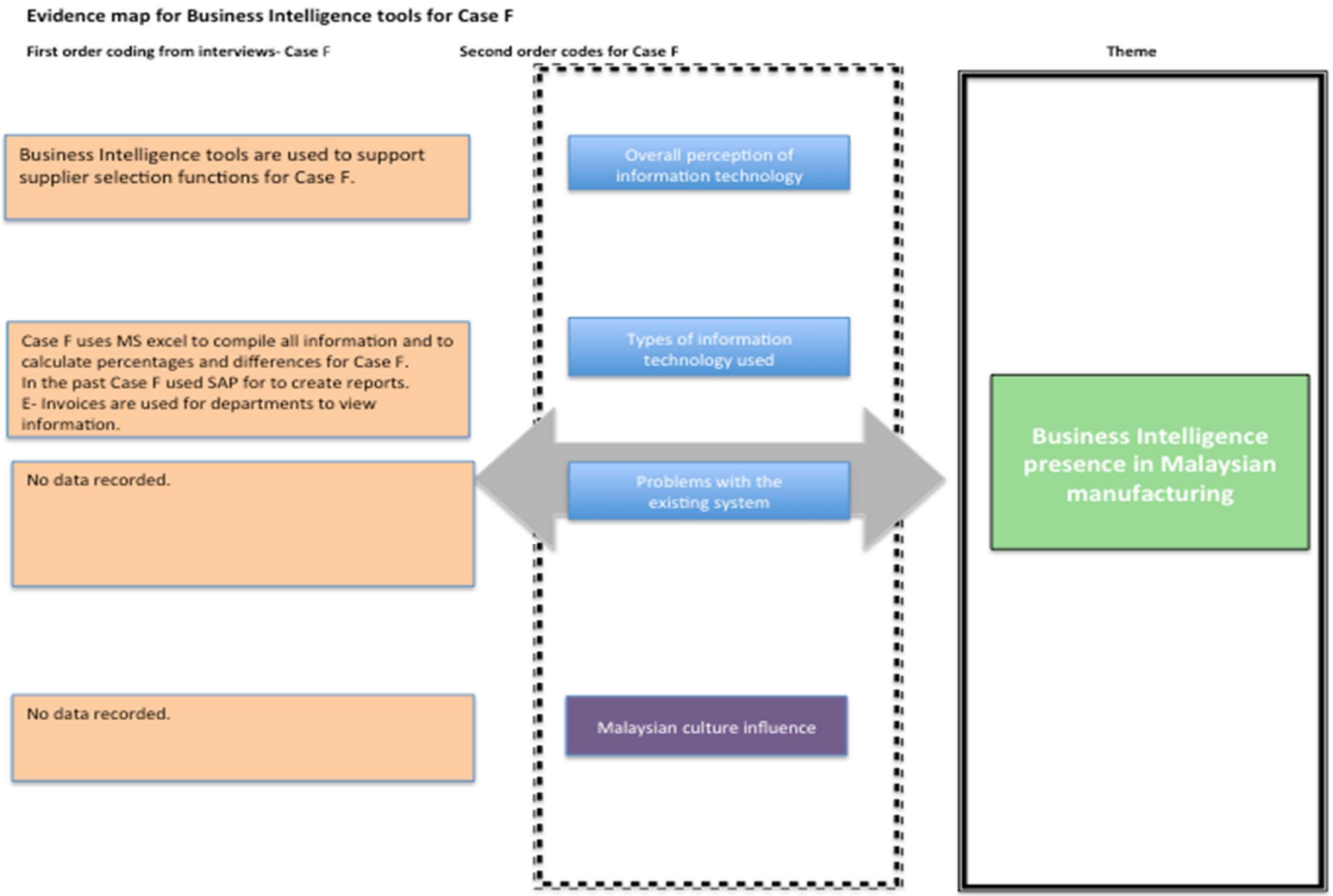


*Figure 4.37 The above evidence map shows the Business Intelligence presence for Case F.*

### 4.19.1 Business Intelligence Presence for Case F

This section of the case study will present the main findings for the use and presence of Business Intelligence tools for Case F.

The areas or topics that is highlighted are as follows: the overall perception of the use of Business Intelligence tools, the types of Business Intelligence tools used by Case F, problems or issues experienced with the existing system and the emerging theme, the impact of the Malaysian culture on the use of Business Intelligence tools for Case F.

#### 4.19.1.1 The Overall Perception of Business Intelligence Tools

The interviewee states that there is the presence and usage of two Business Intelligence tools for Case F. These tools are used to support the supplier selection functions.

The following section will present the types of Business Intelligence tools used by case F.

#### 4.19.1.2 Types of Business Intelligence Tools Used by Case F.

Case F uses Business Intelligence tools to support their supplier selection functions; in this case the interviewee identifies two main Business Intelligence tools.

***MS Excel***

MS Excel is used by Case F to compile information collected from the supplier selection decision-making process, and to calculate percentages and differences.

The interviewee states:

*Most of the tools we are using the Excel to compiling all the information, and to calculate out the percentage difference, etc.*

In addition to MS Excel, Case F uses an E-Invoicing system to automate their process and for the interconnectivity of their departments. The interviewee explains below:

*Invoice. So first of all, all the POs, no need to manually, every time you send a PO release out, the supplier is able to go into the portal, which is a supply.intel.com portal for external people to view how they submit the E-Invoice. The web invoice. And finance also need to be trained, now, how to track the invoice status from our web invoice base. So everything will be E. So you can see that today, when they have any issue on that, they have a tracking status, they go in the supply.intel.com, and they can trace it by themselves, and check by themselves. Unless they are not able to find out, you know, the real information or whatever, they also have a one support—generic support, they can click it, like, you are Singapore supplier then you go back to the Singapore then we have people in the world wide web able to attend to you.*

*Manual—even the invoice, there's no need to send a hard copy of an invoice to our AP. Everything you just post it accordingly, then the system will do a three way match. The three-way match means, you say the PO match the receiving, receiving match the finance, that's all.*

*You're able to see all this information on all the portal. You know, their name, you know, the address, even what type of company they're owning, whether it's a semiconductor or it's electronics or etc., even who are their finance point of contact, marketing point of contact, you know, all these are things that need to be answered.*

*And even that one company, you may create a different login ID. Like you have, finance people have one login ID, you have marketing or sales people have one login ID, so, we will not control that. But I think Intel also have one system to control process. Like every three months the system will be trickled back to the employee validation manager. So, like for example, just as an example, take myself, like myself, I'm from finance, you're from sales department, right? So from that—two of us may have a different login ID and password. OK?*

*So maybe our boss has been nominated to become employee validation manager. So your boss will be playing a role, every three months to make sure that three, or the two of us, are still working at this company. Make sure that we are able to assess, continue to validate every three months. Because it is the case that some people left the company, we did not stop them (1 laughs), so sometimes you know when they go out, they can log in by themselves and check the order and they're able to know what is the order has been given from Intel to them, then they can disclose the price to the competitor.*

*Some of them, they are able to be having their own—I mean, some of them they are able to supporting from Malaysia to China or to Vietnam. Then they can also be engaging to the China or Vietnam database.*

*Even Engineering, they have their own database to keep all the drawings and the specs. Maybe I'm contacting a supplier selection: they will track it from that system, then we will keep it from our end, and then when we sign it, when we contact supplier selection, or we sign the agreement or contract, we also attach the specs into that.*

---

This section highlights the types of Business Intelligence tools used by Case F. These tools are E-Invoicing and MS Excel. The following section will present the problems or issues experienced by Case F in the presence and usage of Business Intelligence tools.

#### 4.19.1.3 Problems or Issues Experienced by Case F

For Case F, the interviewee did not report any issues or problems experienced with the use of Business Intelligence tools. The interviewee states that the system is simple to use.

The interviewee confirms:

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*So far, I think I don't have any problem. It's only thing that, like, how well will, you know, from? And them people, going to operate that. If everyone know how to use that. I can tell you, it's very simple process. Simple system.*

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The following section will present to the findings for the impact of Malaysian culture on the use of Business Intelligence tools.

#### 4.19.1.4 The Impact of Malaysian Culture on the Use of Business Intelligence Tools for Case F

For Case F, the interviewee did not report any findings for the impact of the Malaysian culture on the use and presence of Business Intelligence tools.

To conclude, this section highlights the influence of the Malaysian culture on the presence and usage of Business Intelligence. Case F, uses Malaysian software that is designed and customised to each manufacturing company they service.

The following section will highlight the Artificial Intelligence presence in Case F.

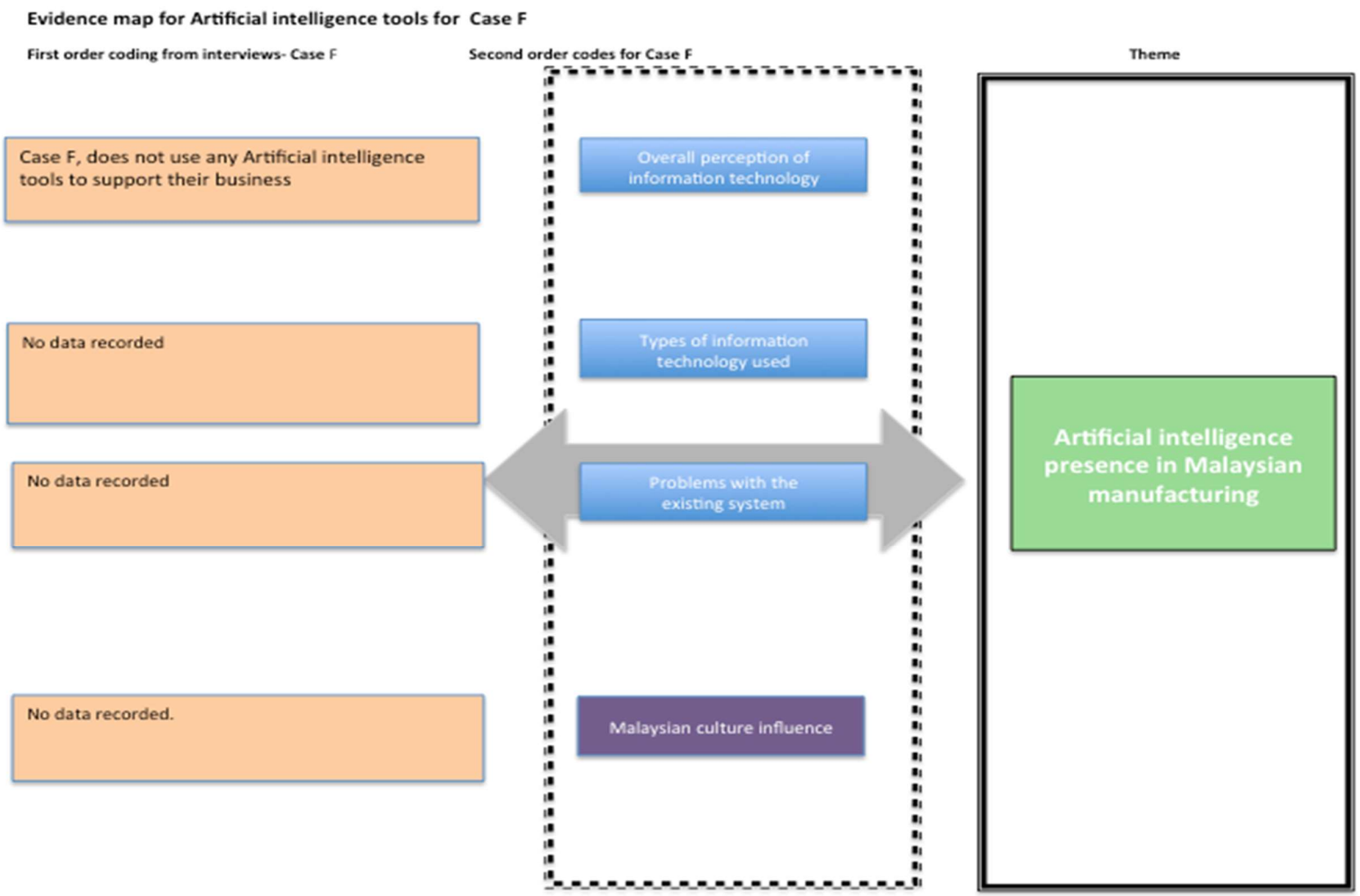


*Figure 4.38 Evidence map for the Artificial Intelligence for Case F.*

### 4.20.1 The Usage and Presence of Artificial Intelligence Tools and Technologies for Case F

This section will present the findings for the usage and presence of Artificial Intelligence tools for Case F. In this section the following areas will be presented: the overall perception of Information Technology, the types if Artificial Intelligence tools used, the problems with the existing system and the impact of the Malaysian culture on the use of Artificial Intelligence tools and technologies.

The first section will present the overall perception of the usage and presence of Artificial Intelligence tools for Case F.

#### 4.20.1.1 The Overall Perception of Artificial Intelligence Tools for Case F

For Case F, the interviewee states that no Artificial Intelligence tools are used in the company.

The interviewee supports:

> *But I don't know the artificial tools; we never use the artificial tools.*

In this section, the interviewee states that no Artificial Intelligence tools are used for Case F. Additionally; the interviewee states a lack of awareness of Artificial Intelligence tools and technologies.

In the following section the types of Artificial Intelligence tools used by Case F will be stated.

#### 4.20.1.2 Types of Artificial Intelligence Tools Used by Case F.

For Case F, no data was recorded for the types of Artificial Intelligence tools used by Case F.

The following section will report the findings of any problems or issues experienced by the use of Artificial Intelligence tools and technologies.

#### 4.20.1.3 Problems or Issues With the Existing System

For Case F, no data was recorded for the problems or issues existing with Artificial Intelligence tools, as no Artificial Intelligence tools are in use.

The following section will report the findings for the impact on the Malaysian culture on the use of Artificial Intelligence tools for Case F.

#### 4.20.1.4 The Impact of the Malaysian Culture on the Use of Artificial Intelligence Tools for Case F

For Case F, data was recorded for the impact of the Malaysian culture on the use of Artificial Intelligence tools for Case F.

In conclusion, there were no findings reported for the use of Artificial Intelligence tools for Case F, moreover, the interviewee was not knowledgeable in the existing Artificial Intelligence tools.

## 4.21 Conclusion

This chapter presented research findings from six cases that analyse the supplier selection decision-making process, the use and presence of Information Technology tools and technologies, the use and presence of Business Intelligence tools and technologies, and the use and presence of Artificial Intelligence tools and technologies in the Malaysian manufacturing industry.

The findings were presented in accordance with the proposed conceptual model in Chapter Three, together with the newly emerged themes from the empirical findings. Each case analysis began with a discussion on the background of the case and followed with the analysis of the four main contributing factors: supplier selection, the presence of Business Information technology, the presence and usage of Information Technology tools, and the presence of Artificial Intelligence tools and technologies. The discussion and the list of propositions for each case are developed from the data obtained from the interviews and document review. From this, evidence mapping is conducted to enable analysis. Newly emerging themes have been reported. Evidence mapping is provided in every dimension in each case to provide clarity in case-finding representation. The next chapter will discuss the cross-case analysis, which describes all six cases with similar and contradicting literature in order to withdraw a compressive conclusion from the findings. The new revised model is also developed in the following chapter.

# Chapter 5:  Cross Case Analysis

## 5.0 Introduction

After conducting the first stage of analysis and producing the detailed reports of the cases in Chapter 5, this chapter presents the cross-case analysis. The researcher uses the conceptual model stated in Chapter 3, to conduct the analysis and answer the research questions of the current study.

## 5.1 Cross Case Analysis of the Supplier Selection Theme

The following sections will present the main findings corresponding to the conceptual framework in Chapter 3.

### 5.1.1 Supplier selection process

This section will compare the supplier selection process for the six cases involved in this study. The following table will briefly present the findings for the six cases:

| Sub theme | Case | Findings |
|---|---|---|
| **Supplier selection process** | A | Trial Buy |
| | B | Trial Buy |
| | C | Trial Buy |
| | D | Trial Buy |
| | E | Structured nine step process |
| | F | Trial Buy |

*Table 5.1 The above table shows the supplier selection process for the cases involved in this study*

Cases B, C, D and F follow a process of their respective companies and use criteria to assess if a supplier meets their requirements, and add the supplier to their approved supplier list. Case B assesses the supplier's financial stability, the quality of the goods and the pricing of the goods, similarly to Case F. However, Case F does assesses delivery time and cost and initiates their process with a purchase order, whilst Case B does not. Case D, initiates their process by assessing if their potential supplier is ISO certified. The ISO certification is centred on quality management, and their suppliers are assessed on their technical abilities, i.e. the machinery that is used. It is noted that Case D buys from their suppliers and waits for the outcome. For this case there was no defined process as compared to the other cases. Case A undertakes a trial buy process for their supplier selection process, as mentioned in the company background section. The nature of the business for Case A is in the manufacturing of raw steel products. Also it is mentioned that in this area of manufacturing, it is a niche market, which Case A does not have to seek their suppliers. In this case, suppliers sought out Case A. Due to this, the supplier selection process adopted is most suitable for the nature of business and their operations. A trial buy is conducted until Case A is comfortable with the supplier. Case E approaches their supplier selection process in a more structured way compared to all of the other cases. Their process consists of nine stages, which the new supplier follows in order to be approved. It can be noted that out of the six cases, Case E's supplier selection process can be influenced as they are a part of a multi-international organisation, and these processes are inherited from their mother company, unlike cases A, B, C, D and F, where it can be noted that there is no generalised structure in which the supplier selection process is undertaken.

Each case's process is predicated upon their own company, and there is an inconsistency with the supplier selection process, although the companies are all project based.

### 5.1.2 How Suppliers Are Located or Sourced

In this section, the different methods by which suppliers are sourced or located is discussed. The following chart represents all of the findings for how suppliers are sourced or located for all six cases involved in this study.

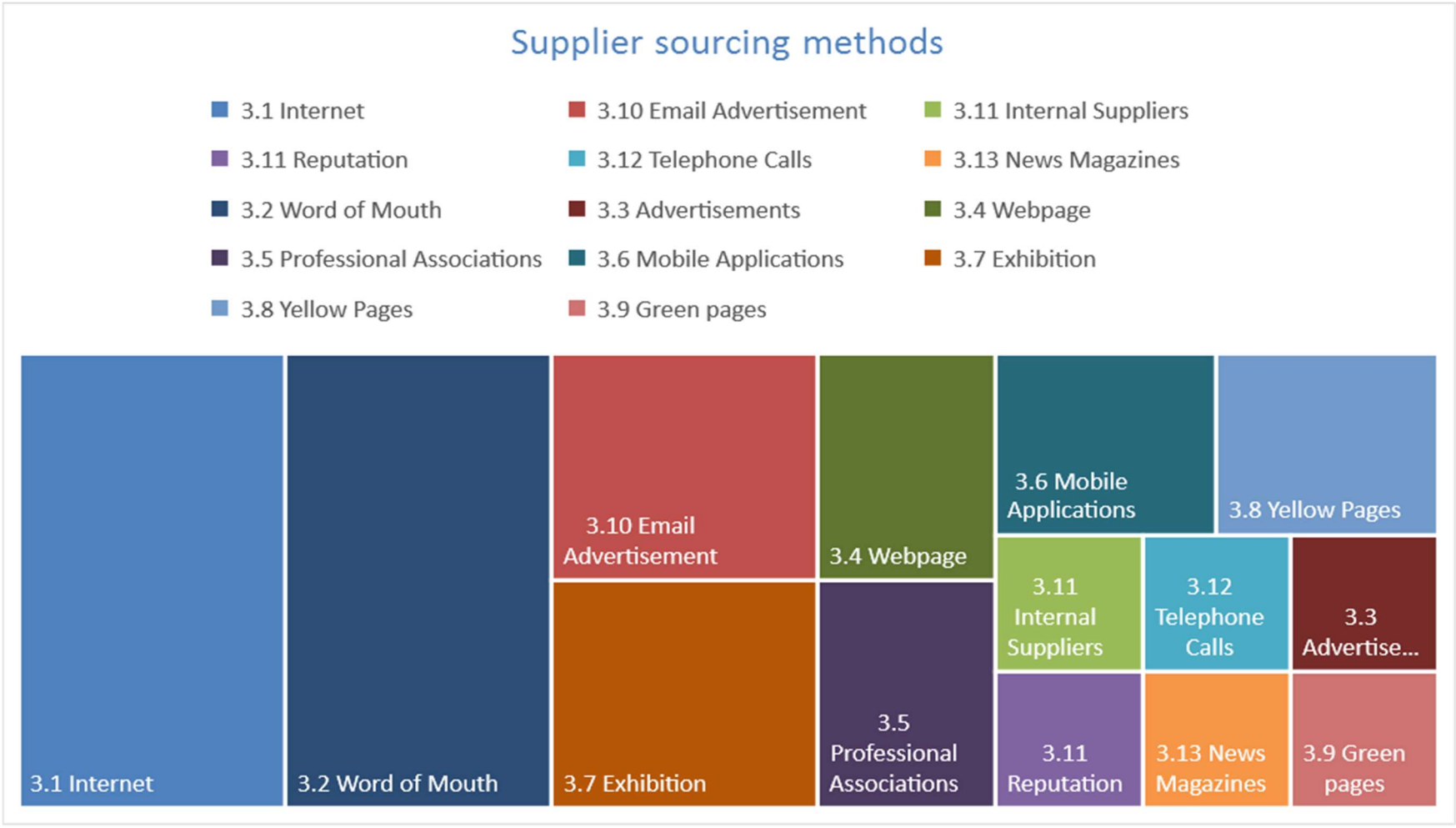


*Figure 5.1 Shows the Supplier Sourcing methods of the cases involved in this study*

It can be noted that the most commonly used methods are word of mouth and the Internet.

#### 5.1.2.1 Word of Mouth

Case A, B, C, D, E and F all stated that word of mouth is used as a method to source or locate their suppliers.

Case A states that due to the nature of their business and how they operate in a niche market, it is most common for their suppliers to contact them.

Case B states that in some cases, when seeking a new supplier, they would consult with other suppliers and exchange information, and in other cases a local supplier would refer them. Case B also states that they try to conduct business with local suppliers; this can be for a level of trust.

Case C, similar to Case B, states that when seeking a new supplier, they would sometimes consult with other suppliers for a referral.

Case D states that their customers introduce most of their suppliers.

Case E although their supplier selection process differs from the other cases in this study, word of mouth is similarly used, as with the rest of the cases, to source suppliers in some cases.

Case F states that other people will refer them to new suppliers or in some cases the suppliers are a friend or family member, and they are happy to conduct business with these suppliers. There is a level of trust that is already established with these suppliers.

#### 5.1.2.2 The Internet

As shown in Figure 5.1, the Internet is viewed as another main supplier sourcing tool used by the cases involved in this study.

The Internet can be categorised into two main sources: *Google.com and Alibaba.com*.

All cases mentioned the use of Google, and three of the cases mentioned the use of Alibaba.com.

Case A mentions the use of both Google and Alibaba.com when locating or sourcing their suppliers. These methods are used to seek additional information about their potential supplier or to acquire information on a product or service.

Case B uses both Alibaba.com and Google.com as a method to locate or source their new suppliers. However, Case B uses the reviews from other buyers as a tool to decide on the potential supplier, and contacts the supplier directly, unlike Case A, who contacts the supplier through Alibaba.com.

Case C, similarly to Case A and B, uses both Alibaba.com and Google to locate or source their new suppliers. Google is viewed as a tool that enables Case C to source new suppliers internationally and locally and provides the opportunity to view reviews from other buyers, in order to make more informed decisions. Case C, similarly to Case B, does not contact suppliers directly through Alibaba.com as with Case A. Case C contacts the supplier directly.

Case D, unlike Cases A, B and C, does not use Alibaba.com to source or locate their suppliers. However, Case D, uses Google, similarly to Cases A, B, and C.

Case E, similarly to Case D, does not use Alibaba.com to source or locate their suppliers. However, Google.com is used.

Case F is similar to Cases B and C as they all use Alibaba.com as a method to source or locate their suppliers, but it does not use this method to contact the suppliers. Supplier details are extracted, and suppliers are contacted directly.

As this section indicates, Google.com and Alibaba.com are methods used by all of the cases involved in this study. These methods are viewed as feasible and easy to access by the cases to acquire information on potential suppliers.

#### 5.1.2.3 Exhibition

Exhibitions are also viewed as another effective method to locate or source new suppliers for Cases B and F.

Case B views exhibitions as a form of networking in their industry, where they will have the opportunity to meet new suppliers and some new suppliers will gain awareness of their company.

Case F similarly to Case B views exhibitions as a method of meeting new suppliers in order to gain awareness of their company.

Cases A, C, D, and E did not mention exhibitions as a method by which new suppliers are sourced or located.

#### 5.1.2.4 Yellow Pages

Cases B and C, similarly use this method to source new suppliers. As previously mentioned, Cases B and C are both project-based companies who manufacture steel-based products, and in some cases some products or services that are relevant to their company are required. Cases A, D, E and F did not mention yellow pages as a method by which suppliers are sourced or located.

#### 5.1.2.5 Mobile Applications

Case A and Case B both mentioned mobile applications as a method used to locate or source new suppliers, whilst Cases C, D, E, and F did not mention mobile applications as a method used to source or locate new suppliers.

Similarly, the mobile application mentioned by both cases is called the ECCM. This mobile application as explained by both cases. Furthermore, it allows for the sourcing of new suppliers and for acquiring information about the current steel market. This application can provide a more informed decision on the cost of steel, and is monitored by Case A and B.

#### 5.1.2.6 Professional Association

Professional association has been identified by Case B and D as an effective method to locate or source new suppliers and to acquire information on new products and services to make more informed decisions.

Case B did not identify any specific professional association, whilst Case D, states that professional associations have also allowed them to gain many new projects.

Cases A, C, E, and F did not identify professional association as one of the methods used to locate or source new suppliers.

#### 5.1.2.7 E-Mail Advertisement

Case A and E identifies email advertisement as a method used to source or locate new suppliers. Cases B, C, D and F did not mention this as a method used to source or locate new suppliers.

Case A states that on a regular basis, email advertisements by potential suppliers are sent to alert Case A on products and services from the potential supplier. However, in some cases the emails are ignored because of the informal manner in which they are sent. In other cases, when there is a need for a particular product or service, Case A can further enquire from information sent by email advertisement.

Case F, similarly to case A, receives email advertisement on a regular basis from potential suppliers. However, unlike Case A, the emails are ignored due to the fact that site visits cannot be conducted, as in most cases the potential supplier is not local.

Both Case A and F, receive email advertisements but in some cases the method is ignored, but for different reasons. For Case A, the method is too informal and for Case F, the method is not feasible.

#### 5.1.2.8 Green Pages

Case B mentioned green pages as a method used to locate or source new suppliers. Cases A, C, D, E, and F did not mention green pages as a method used to locate or source new suppliers.

Greengages in Malaysia advertises services and products available from potential suppliers. Case B, uses this method amongst others to have a wide variety of methods to source suppliers for their business needs.

#### 5.1.2.9 News Magazines

Case A, identifies news magazines as a method by which new suppliers can be sourced or located.

Cases B, C, D, E and F did not mention news magazines as a method by which new suppliers are sourced or located.

Case A, as previously mentioned, does not share any similarities with the type of business conducted as Case B, C, D, E and F. Case A is a manufacturer of raw steel materials, unlike the remaining cases, who are project-based, steel-based manufacturing companies.

This difference indicates that Case A, would be able to locate or source new suppliers from different sources than the other cases.

Case A states that the World Steel Association Magazine and Steel First Magazines are used to source or locate new suppliers. These magazines provide a different avenue for Case A, to source different raw steel, with different specifications for different customers.

#### 5.1.2.10 Telephone Calls

Case A, identifies telephone calls as a method by which new suppliers can be sourced or located.

Cases B, C, D, E and F did not mention telephone calls as a method by which new suppliers are sourced or located.

This difference indicates that Case A would be able to locate or source new suppliers from different sources than the other cases.

Telephone calls are used in the events where Case A is uninformed about a particular product and is seeking a supplier that can supply a specific product. Telephone calls will be made to current suppliers to advise on other suppliers to supply a particular product.

#### 5.1.2.11 Reputation

Case A identifies reputation as a method by which new suppliers can be sourced or located.

Cases B, C, D, E and F did not mention reputation as a method by which new suppliers are sourced or located.

Case A mentions that the nature of their business operates in a niche market, and due to this, Case A is recognised in Malaysia. Their reputation allows for suppliers to seek them instead of them seeking suppliers. In rare cases, Case A would be required to source or locate suppliers.

#### 5.1.2.12 Internal Suppliers

Case E identifies internal suppliers as a method by which new suppliers can be sourced or located.

Cases A, B, C, D, and F did not mention reputation as a method by which new suppliers are sourced or located.

In the previous section (6.1.2 Supplier selection), the supplier selection process of Case E is explained as having a structured nine-stage process. In this process, suppliers that are approved after the nine stages are then placed on the approved supplier lists. However, suppliers on the approved list are not guaranteed to be used at that point in time. For Case E, when there is a need for a particular service of

product, their internal supplier list is searched and assessed for a supplier that can provide them with the service that is needed at that point in time.

Similarly, this supplier selection process also occurs with Cases B, C, D and F, but the method of using internal suppliers was not mentioned by these cases.

This section presents how suppliers are located and sourced for cases A – F. This section also presents the differences and similarities between the cases. The following section will discuss the supplier selection criteria used by the cases involved in this study.

### 5.1.3 Supplier Selection Criteria

In this section, the different supplier selection used by the cases involved in this study are discussed. In chapter four, the supplier selection criteria used for each case was highlighted and in this chapter, a comparison of similarities and differences will be presented. For the purpose of this section, the below table presents the supplier selection criteria for the six cases involved in this study as highlighted in Chapter four.

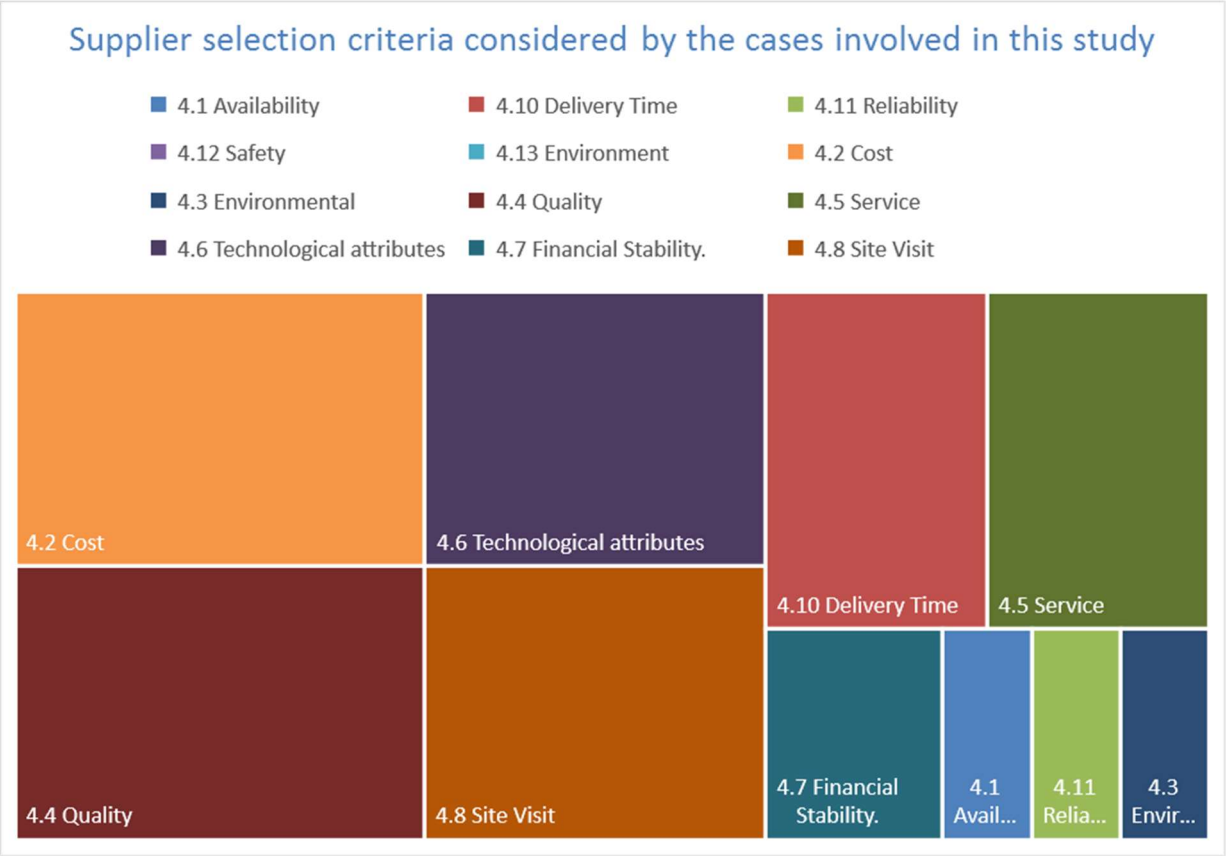


*Figure 5.2 derived from empirical research, the table shows the supplier selection criteria mentioned by the six cases involved in this study.*

### 5.1.3.1 Availability

Availability has been identified as a pertinent supplier selection criteria by Case F. The other cases did not mention availability as a pertinent supplier selection criteria.

### 5.1.3.2 Delivery Time

Case's A, B, C and E identify that delivery time is a pertinent supplier selection criteria in their decision-making process.

As previously discussed in section 6.1.1, Case A used a trial-buy process for their supplier selection process, and for new suppliers, the delivery time is assessed. Case

A will disregard the supplier if the delivery time is not acceptable. Case B identifies delivery time to be a pertinent supplier selection criterion, as the delivery time impacts on the delivery time of their product or service to their customer. Case C is similar to Case A and B, in identifying the importance of delivery time from their supplier, as for Case C, similar to case B, is a project-based steel-based manufacturer, delivery time from their suppliers impacts on the delivery time of their product or service to their customer. Case F, similar to case B and C, states that delivery time is also a pertinent supplier selection criterion, as the delivery time also impacts on their product or service to their customer. Case F also states that if suppliers are unable to deliver in a timely manner, customers will often go to another manufacturer that can deliver in the time that they need. This is not good for competitive advantage. It can be noted that for Case E, with regards to their supplier selection process, as there is a more structured process from their parent company, delivery time is not considered to be an assessment criterion. In the nine stage process, as mentioned in Chapter 5, agreements were signed with companies to eliminate this factor.

#### 5.1.3.3 Reliability

Reliability is highlighted as a pertinent supplier selection criterion in the decision-making process for Case C. Cases A, B, D, E, and F did not mention reliability as a supplier selection criterion that is considered in their supplier selection decision-making process. In the case of reliability, Case C describes reliability in relation to the reliability of the delivery. Case C requires their suppliers to be reliable with their delivery time, as this is important to the production of their products and services. It can be noted that this factor is important to Case C due to the nature of their business

as a project-based steel manufacturer. It also can be noted that Cases B, D and F are also project-based manufacturers, but reliability was not mentioned. Case F also states that most of their suppliers are based in Malaysia, so this factor can be more controlled and in some cases eliminated.

#### 5.1.3.4 Cost

Cost has been identified as a pertinent supplier selection criterion in their decision-making process by all of the cases involved in this study. Cost is also referred to as pricing in this study. Case A states that cost is one of the most important factors when considering a supplier. Cases B, C, D, and F, are all identified as project based companies who all considers cost to be an important supplier selection criterion. They all state that the cost of materials from the supplier, impacts on their product, with respect to the cost in which they sell to their customer. If the cost of the material purchased from the supplier is high, the customer can then go to their competitor. In Case E, cost is also mentioned as a pertinent supplier selection criterion. However, for Case E, cost is seen as being as important as quality.

#### 5.1.3.5 Quality

Quality has been identified as one of the main supplier selection criteria in the decision-making process for all of the cases involved in this study. In addition to this, some of the cases involved in this study are ISO 9001 certified. This certification is an international standard and places emphasis on quality management of the organisation involved, as explained in Chapter Five. Case A mentions quality as one of the most pertinent criteria due to the nature of their business. Additionally, Case A is also a main player in a niche market of raw steel manufacturers in Malaysia and it is important that they achieve a high quality of material compared to their competitors.

For Case B, quality is identified as a pertinent supplier selection criterion, as they require high quality products or services so they can deliver a high quality product to their customers. If this cannot be achieved, their customers can resort to using a competitor. Similar to Case B, Case C states that quality is not a supplier selection criterion that can be compromised. Case D, similar to the cases involved in this study, also states that quality is not a supplier selection criterion that can be compromised in addition to the quality of the products or services supplied.

Case E, also similar to the other cases involved in this study, states that quality cannot be compromised; as their products are sold to an international market, their preference is quality over cost.

Case F is similar to Case B C, and D, as they both require a high quality product from their suppliers, so they can produce a high quality product for their customers in order to compete with other companies in their sector.

#### 5.1.3.6 Service

Service is mentioned as a pertinent supplier selection criterion in the decision-making process for Case C, D, E, and F. There was no mention of service being a pertinent supplier selection criterion for Cases A and B.

Case C mentions that service is a criterion that cannot be measured or assessed without trying a purchase from the supplier, unlike pricing and delivery time, which is a factor that can be defined before purchase. Case C also categorises service with quality, as these can both only be assessed after the purchase. Case C also states that service is one of the factors that have the most problems in the supplier selection process, specifically the after-service of a product.

Case C uses reviews from other buyers to make an informed decision with regards to the service of the supplier, but in some cases, there is no information about this or the information is not consistent with the experience of Case C.

Case D is similar to Case C with regards to service, in stating that service is an important supplier selection criterion in the decision-making process. However, Case D will have to wait until after a purchase is made from the supplier to assess or evaluate their service. Similar to Case C, if the service is not acceptable, the supplier will not be used and will be placed in the inactive supplier list.

Case F highlights service as a pertinent criterion in their decision-making process and this service is also a critical criterion in their production process. For case F, relationships are seen as an important factor to their business, and good service is a result of good relationship building with their suppliers. Case F, also states that most of their suppliers are either friends or family of Case F, and this helps with good relationship building, which will result in good service. It can be noted that this factor relates to the emerging theme of this research, and will be discussed later on in this chapter.

Case E also mentions service as a supplier selection criterion and highlights another aspect of service that is not mentioned by the other cases. Case E speaks about the liability of a product and the responsibility of a product with regard to service. Service is mentioned as a legal factor with regards to Case E. Additionally, Case E mentions that the supplier is also responsible for the replenishment of a product, unlike the other cases.

#### 5.1.3.7 Technological Attributes

Technological attributes are mentioned as a pertinent supplier selection criterion to the decision-making process by Cases A, B, D, E and F. Case C did not mention technological attributes as supplier selection criterion considered in the decision-making process.

Case A states that technological attributes are important, as their suppliers need to be knowledgeable of different requirements for products they require. Case A explains that this is important to them to operate in a niche market and for Case A to meet the needs and demands of their customers. Case B is similar to Case A, in identifying technical ability as a pertinent supplier selection criterion in their decision-making process.

Case B states that the research and development team is important to the purchasing process, as they need assurance that the materials supplied by the supplier can produce the product for the customer. The supplier must be knowledgeable so they can advise this department. Case F is similar to case D in identifying technological attributes as a pertinent supplier selection criterion. The materials supplied by the suppliers will need to be able to conform to different elements of the customer requirements. Case E's nature of business is unlike Case B and F. However, technical attributes are still highlighted as a pertinent supplier selection criterion for the decision-making process. Although the nature of the business differs, the reason for highlighting technical ability is the same. It is necessary for their suppliers to have knowledge in how their products are capable of producing good quality for Case E.

#### 5.1.3.8 Financial Stability

Financial stability is identified as a pertinent supplier selection criterion in the supplier selection decision-making process for Case B and E. The other cases involved in this study do not mention financial stability as a pertinent criterion in the supplier selection decision-making process.

For Case B, financial stability is referred to as company performance, and this criterion is related to the reliability of the company. This factor looks into the financial debt, and in general, to ensure that this supplier is a viable business partner for Case B. Case E, similar to Case B, also mentions financial stability as a pertinent criterion for the supplier selection decision-making process. Both cases, integrate assessing the financial stability of a supplier in their initial assessment during the supplier selection process.

Case E assesses the financial stability in their nine stages of supplier selection. A supplier is required to submit financial reports for three years so that debt ratios and collection ratios can be assessed by Case E. Although this is a criterion for Case B, this structured process does not exist for Case B. Case E, also explains that assessing a supplier's financial stability will result in knowing if a company is high risk or not. High risk suppliers are viewed as dependent, and this is not a supplier that Case E will shortlist for their approved supplier list.

#### 5.1.3.9 Site Visit

Site visits have been identified as a criterion that is pertinent to the supplier selection decision-making process by Cases A, B, C, D and F. Case E did not mention site visits as a criterion pertinent to their supplier selection decision-making process.

Case A states that site visits are important to ensure the validity of the supplier and for the relationship with the supplier. Mostly, for Case A, their suppliers are not all based locally. However, it is mentioned that the suppliers that Case A does business with are suppliers who are known to Case A, and as a result this builds trust.

Case B also mentions site visits as a pertinent supplier selection criterion in the decision-making process. Stating that new suppliers are sometimes met through exhibitions, and they are unknown, and for Case B, it is important to build face-to-face relationships with their suppliers, so in most cases a site visit is conducted. Similarly, Case C also states that site visits is an important criterion in the supplier selection decision-making process. However, Case C states that the reason for site visits is to ensure accuracy of information, and to ensure that the supplier exists. In the past, Case C experienced false suppliers. Case C prefers to ensure the validity of the supplier prior to adding them to their approved supplier list.

Case D, similar to Cases A, B and C, have identified site visits as an important criterion in the selection of new suppliers. Similar to Case C, Case D has past experiences with false suppliers. Case D explains that these suppliers are found online, the suppliers appear to be legitimate and an order is placed and in some occasions the products are never delivered. Due to this, Case D performs site visits for their new suppliers, as most of their suppliers are based locally and no suppliers are sourced on the Internet, or mobile applications or Alibaba.com.

For Case F, site visits are also seen as in important supplier selection criteria in the supplier selection decision-making process, similar to cases A, B, C and D. However, Case F states that most of their suppliers are of friend and family association, and this eliminates the problem of false suppliers. In other cases, for Case F, their suppliers are not based locally, so this presents an issue for site visits. If new and unknown

suppliers are based locally, site visits are conducted for validity reasons and for relationship building.

### 5.1.4 Who Is Responsible for Decision-Making

This section will present and discuss the decision makers responsible for the supplier selection decision-making process for the all of the cases involved in this study.


*Figure 5.3: - Derived from empirical studies to show the supplier selection decision makers for the cases involved in the study.*

#### 5.1.4.1 Procurement Team

Cases A, B, C and F all have a procurement team that is responsible for the decision-making for new suppliers. Case A refers to the team as a purchasing team, similar to Case B. Case C refers to the team as a sourcing room, and Case F refers to the team as the procurement team.

Case A states that the purchasing team is responsible for the selection of new suppliers. The team also relies on the Internet and Alibaba.com, as mentioned in

section 6.1.2 as methods to support their decision-making process. The company's managing director makes the final decision. The purchasing team also take responsibility for the selection of the new supplier in Case B.

For Case B the purchasing team is made up of four different departments who are responsible for different sections of the business. This will differ from Case A, as the nature of the business differs from Case B. Case B will be required to purchase different types of materials, whereas Case A only purchase one type of product.

Case C, unlike Cases A and B, will only locate and select new suppliers and ensure that they meet all of the set requirements. This information will then be passed on to the finance department to make the final decision. Case F, similar to Cases A and B, also relies on their purchasing department to make the final decision in the selection of new suppliers in the decision-making process. Their purchasing team will ensure that the supplier meets the requirements and issue purchase orders. It can also be noted here for Case F, that most of their suppliers are either family or friends, and this encourages a level of trust with their suppliers. For Case C, where the finance department makes the final decision on suppliers, financial checks are conducted to ensure the financial stability of the supplier.

#### 5.1.4.2 Operations Manager

With Case D, unlike Cases A, B, C, E and F, their operations manager is responsible for the final supplier selection decision-making. This is due to the operations manager having engineering experience; a more informed decision can be made with regards to the technical attributes.

#### 5.1.4.3 Supply Team Members

Case E relies on supply team members to make the final decisions on the selection of new suppliers. Although the supply team is similar to Cases A, B, C, and F, the supplier selection process differs to Case E. Case E does not require a second person to make the final decision due to their structured supplier selection process. Case E explains that the supplier selection process of a new supplier takes an average of a year to be completed, compared to the other cases involved in this study. The reason for this is, the supply team members conduct each of the nine processes identified in a thorough manner, and there are protocols and procedures to be followed that they have inherited from their parent company. If the supplier meets the requirements set out from Case E, the supplier is then added to the approved supplier list.

#### 5.1.5.5 Supplier Evaluation or Audit

In this section, the supplier evaluation or supplier audit process will be compared for all of the cases involved in this study. The supplier evaluation or audit process is conducted after a new supplier is accepted to the approved supplier list and after purchases are made from the buyer. To establish if the supplier meets the requirements of the buyer or for the purpose of this research, the supplier is evaluated using different criteria. This section will highlight the similarities and differences amongst the different cases involved in this study.

Case A states that when a supplier is selected through the supplier selection process, a trial buy is undertaken. If the trial buy meets the standards set out by Case A, the supplier graduates to the approved supplier list. However, Case A confirms that other than the trial buy process, there is no evaluation or audit process that is carried out on

their current suppliers. Case A states that if the trial buy is unsuccessful and not meeting the requirements, the supplier will not be used in the future.

For Case B, their suppliers are categorised into four categories, and this is predicated on a rating system devised by Case B. Chapter five displays the document inherited from Case B, which reflects the four different categories. The rating is based on the sum of funds spent by Case B on each supplier. If purchases are under twenty thousand Malaysian ringgits per year, the supplier will be removed from the list of suppliers. Supplier performance, delivery date and quality are also criteria that the supplier evaluation is based upon. Case B undertakes this process on an annual basis and similar to Case C, supplier evaluation is based on how much revenue is given to them. However, unlike Case B, there is no structured process with regards to the supplier evaluation process. The Business Intelligence system that the approved supplier list is stored on, allows a sort to take place, and any supplier that is above ten thousand ringgits per annum is considered to be an active supplier, and those who are not, are declared inactive suppliers. This process is undertaken on a monthly basis where a rating process is undertaken based on delivery time, but suppliers are never disqualified like Case B; suppliers are monitored as they may be of importance to Case C. Case D states that they are an ISO certified company, and in most cases, their suppliers are ISO certified. This ISO certification, which is explained in Chapter 5, relates to quality management. Case D assumes that the supplier is following the ISO guidelines and eliminates the evaluation process due to resources and the time that the evaluation process takes. Case E, is similar to Case B and C, where there is a structured process undertaken by the company. For the supplier evaluation process Case E, the supplier evaluation process is a part of the nine-stage supplier selection process set out by Case E. Unlike Cases B and C, suppliers are not evaluated after a

purchase; moreover, the suppliers are evaluated at the beginning of the process, and there is no auditing process conducted on their supplier list. Case E eliminates the auditing process of their suppliers. Case F is similar to Case A, where there is no structured process undertaken to evaluate or audit their suppliers. For case F, the service of the supplier is monitored from past transactions and if the delivery time is always delayed, the supplier will not be selected for future purchases. However, every three months the supplier's performance is overlooked only for suppliers who had issues in the past with Case F.

#### 5.1.5.6 Protocols and Procedures

Case A does not mention any protocols and procedures adhered to, but only mentions a mill certification that corresponds to the quality of their product.

Case B states that they are an ISO certified company. Due to this, Case B states that the ISO 9001 certification impacts on many processes in their business, for instance, their supplier evaluation process, their record keeping process, where a hard copy is required to be kept, and for every purchase order to suppliers is seen as a legally binding document, where a stamp needs to be placed. These processes allow them to follow the ISO 9001 requirements and allow Case B to preserve their ISO certification.

Case C also mentions ISO 9001 certification as a procedure by which they follow. These requirements are also inculcated into Case C's processes to upkeep with ISO 9001's quality standards. Case C mentions the importance of documentation as an important factor for the upkeep of the ISO 9001 standard. Similarly, to Case B, documentation is mentioned as an important factor for the ISO 9001 standard.

However, Case C does not mention the ISO 9001 standard as a part of their supplier evaluation process.

Case D, similar to Case B and C, mentions the ISO 9001 certification and the impact on the processes of the company.

Case D states that this procedure impacts on the supplier selection process of some of their suppliers; it is according to the product or service that is being provided by the supplier. Case D also states that for some of their suppliers ISO certification is necessary and in some cases ISO certification is not necessary for some of their suppliers. As mentioned earlier in this chapter, for suppliers who are ISO certified, an evaluation process is not conducted, as these suppliers are expected to follow certain procedures to preserve their ISO registration. Case E mentions protocols and procedures as being a part of their supplier selection process, but does not mention the ISO 9001 certification, unlike Cases B, C and D. Case E mentions legal agreements with their suppliers and their nine stages of the supplier selection process. It can be noted that due to the nature of their business and their relationship to their parent company, ISO 9001 is not mentioned or required.

Case F did not mention any protocols or procedures as part of their supplier selection process. It can be noted that the ISO 9001, as discussed in this chapter, is another method of ensuring a top quality product or service, and for Case F, as their suppliers are mostly friend or family association, this can be a reason for not incorporating the ISO 9001 certification as part of their supplier selection process.

### 5.1.6 Problems or Issues with the Supplier Selection Process or Suppliers

This section will highlight and discuss the problems or issues faced by all of the cases involved in this study in the supplier selection process or with suppliers.

The following table presents a summary of these problems or issues, which will be discussed in this section.

| Problems with the supplier selection process | Cases |
|---|---|
| 14.1 Inaccurate Information | |
| 14.10 Culture | |
| 14.11 Time | |
| 14.13 Data Acccuracy | |
| 14.15 Quality | |
| 14.16 Communication | |
| 14.2 Supplier sourcing problems. | |
| 14.3 No Difficulty | |
| 14.4 Technical Ability | |
| 14.5 Staffing | |
| 14.6 Location | |
| 14.7 Volume of Product | |
| 14.8 Amount of Stock | |
| 14.9 Cost | |

*Table 5.2 This table is derived from the empirical findings, and highlights the problems faced with the supplier selection process or with suppliers.*

#### 5.1.6.1 Inaccurate Information

Case A identifies unclean and inaccurate data as one of the problems experienced in the supplier selection decision-making problem. Whereas Case B, unlike Case A did not identify issues or problems with inaccurate data, but expressed issues with information about suppliers gathered by some of the sourcing methods.

Case C states similar issues to Case B, with regards to inaccurate information acquired from the Internet, specifically Google.com and Alibaba.com. Case C also

states from past experiences that they have made purchasing orders with fake suppliers and was unable to recover their funds, or receive their product or service from the supplier.

Similarly, Case D states that information gathered by Alibaba.com and Google.com can be inaccurate with the products and services supplied by some suppliers. For Case D, similar to Cases B and C, Google.com is used to identify potential suppliers but suppliers are contacted directly.

Case E does not mention any issues with inaccurate information, due to their nine stage structured supplier selection process. Each new supplier goes through these nine stages, which usually takes a year.

Case F did not mention any issues with inaccurate information, as Case F states that most of their suppliers are of friend or family association or from word of mouth and reputation; by using this method it eliminates inaccurate information issues.

It can also be noted here that, the cases which identify inaccurate information as an issue or problem can be linked to their supplier selection process, whereby suppliers are accepted as approved suppliers, and await a purchase from the cases, unlike Case E, who has a more structured and thorough approach to the supplier selection process. Case F also does not state these problems exist, unlike Cases B and C, as a more familiar approach is undertaken by Case F. For Case A, due to the nature of their business, their suppliers will also be niche market, and will also be able to identify false suppliers more easily. There is a direct relationship to this issue with the method of how suppliers are sourced and located to each supplier.

#### 5.1.6.2 Time

For this issue, the only case involved in this study who mentioned time as a problem or issue is Case A. Time, in this respect, refers to the time that the product takes to reach the base of operations in Malaysia.

#### 5.1.6.3 Quality

For this issue, Cases A, C and D identify quality as a problem experienced in the supplier selection process.

Case A identifies quality as an issue experienced in the supplier selection decision-making process. In this instance, quality issues are related to poor handling and oxidisation of their goods due to the distance travelled.

Case C states that the quality of the material is also an issue. For Case C, quality issues are related to the purchase of raw steel to produce their products. In some cases, the quality of the raw steel received is rejected, due to the poor condition of the material. These are issues that Case A mention.

Case D differs to Case A and Case C, where quality is discussed in relation to the quality of equipment of their suppliers, so that a quality product can be purchased by the case. In order for Case D to produce a quality product, quality equipment used by the supplier is important.

Cases B, E, and F, did not mention quality being an issue.

#### 5.1.6.4 Communication

Case C identifies communication with their suppliers to be an issue in their supplier selection process. The other cases in this study did not identify communication as an

issue or problem in their supplier selection process. However, in this case, Case C expresses that for new suppliers, communication is always a concern with regards to pricing and quality. Without seeing a product, the quality is unable to be determined. However, Case C will still need to pay for these products.

#### 5.1.6.5 Supplier Sourcing Problems

Cases B, C and F have identified supplier sourcing problems as a problem or issue.

Case B states that the majority of their suppliers are locally based, for the main reason of being able to conduct site visits and have a better control of their products purchased from their suppliers. However, in cases where a specific material is needed and cannot be sourced locally, an issue arises, where other suppliers will need to be located either regionally or internationally. This issue also introduces other issues such as fake suppliers and inaccurate information, and removes the ability for a site visit to be conducted to ensure the validity of the supplier. This factor also impacts on time, as this case is also a project-based manufacturer, time taken to source a particular product or service, affects their resources and their ability to deliver to their customers within the agreed time.

Case C, similar to Case B, also expresses an issue with supplier sourcing problems at times. Although the problem is similar with supplier sourcing, Case F's supplier sourcing method is different to Cases B and C. Case F states that when there is a problem sourcing a particular product or service, they would contact a friend or family member, and would be referred to a new supplier by word of mouth. The other cases involved in this study did not mention any issues with supplier sourcing. It can be assumed for Case A, that this relates to the nature of their business. For Case D, their range of products is not as wide as Cases B, C and F and E.

#### 5.1.6.6 Technical Ability

Technical ability has been identified as a problem faced by Case B and F in their supplier selection process. For these cases to be successful, their suppliers must have a level of technical ability for the cases to produce their end product. In both cases the suppliers meet with the research and development team of the respective cases to discuss the ability of the product sold to them by said supplier.

Case B states that in some cases there is a lack of technical ability amongst some of the suppliers, whereby some suppliers are not aware of the capabilities of their product or service.

Similarly, to Case B, Case F states that in some cases, due to the engineering of a particular product, there are restrictions with regards to the suppliers, as some suppliers do not understand the capabilities, which affects Case F.

#### 5.1.6.7 Location

Location of the supplier has been identified as an issue experienced by Case A and B. Case A states that the location of the supplier is an issue. Case A's suppliers are based both regional and international. Although they are able to eliminate issues with supplier sourcing, the location of the supplier serves as an issue, and also affects the quality of the product. Similarly, Case B states a problem with the location of the supplier. This issue can also be related to quality, delivery time and quality of their product from their supplier. Case B states that due to the location of some suppliers they also face licensing problems and the issue of high customs fees for the product. Also, if the quality of the product is poor, it is also difficult for any action to be taken if

the supplier is overseas. In this instance, Case B is at a loss with the product. The other cases involved in this study do not mention location as an issue.

#### 5.1.6.8 Pricing

Cases B and C have identified pricing, or cost of materials from the suppliers, as a problem or issue. The other cases mentioned in this study does not mention pricing as an issue.

Case B also has an obligation of a delivery time to their customers, and in some cases, due to the location and the accessibility of the products required to produce their product, Case B would have to pay more for some products from their supplier, so that they can deliver to their customer on time. In some cases, Case B will pay more to a supplier so that the delivery time will be faster.

Similarly, Case C will pay a supplier more to ensure a quicker delivery time. Case D did not mention pricing as an issue. Case E states that their suppliers are sourced through friend and family association, where pricing can be negotiated.

### 5.1.7 The Effect of Malaysian Culture on the Supplier Selection Decision-Making Process

This section will discuss the emerging theme and its relationship to the cases involved in this research. The findings indicate that there is an impact of the Malaysian culture on the supplier selection decision-making process, and this will be highlighted in this section.

The main issues identified for supplier selection is summarised in the following table.

| 15. Malaysian Culture | |
|---|---|
| 15.2 Friend or Family Association | 3 |

*Table 5.3 This table has derived from the empirical data. This table summarises the impact of the Malaysian culture on the supplier selection decision making process.*

#### 5.1.7.1 Friend or Family Association

The friend or family in this instance relates to the impact on supplier sourcing methods used in the cases involved in this study.

Some of the cases also mention the importance of building working relationships with their suppliers, by formal and informal meetings. Case F states that most of their suppliers are of friend or family association, or that friends or family refer new suppliers. Due to the trust factor and networking for Case F, the impact of the Malaysian culture has proven to eliminate some of their supplier selection problems. Case F, also states that through friend or family extensions, they would have experience with certain suppliers and Case F trusts this review; they are willing to accept new suppliers through this method.

Case B also adds to the family and friend association, by stating that other suppliers who are their friends will introduce them to new suppliers. They trust their experience and review of this supplier, so Case B is comfortable and can make an informed decision on this supplier.

Case A also mentions that in most businesses in Malaysia, suppliers are of friend or family association, and they build relationships through formal and informal meetings. This is important to them, as this helps when problems arise. Similarly, to Case A, Case F, did not report any issues with regards to pricing; as other cases in this study

report, this is due to their suppliers being of friend or family association, and this helps reduce pricing.

Case D, also finds the friend or family association to be beneficial to their business. Relationship and networking is viewed as being an important factor to Malaysian manufacturers, especially when seeking new suppliers. Case D states that most of their suppliers have been introduced to them by connection of a friend or family. It can be noted that for Case D, another method of supplier locating or sourcing is through professional association. This also highlights that their suppliers are being sourced though professional connections. Case E also refers to their suppliers, to give a review or previous experiences from other suppliers about a potential supplier. Case C is the only case in this study that does not mention family or friend association.

### 5.1.8 Conclusion

This chapter presents the similarities and differences for the supplier selection theme, and its sub themes. This section compared the six cases involved in this study through the following sub themes: supplier selection process for the six cases, the methods by which the cases source or locate their new suppliers, the main supplier selection criteria, who the decision makers are, their supplier evaluation or audit process protocols and procedures, problems with the supplier selection process and the emerging theme and the impact of the Malaysian culture on the supplier selection decision-making process.

### 5.2.1 Information Technology Tools

#### 5.2.1.1 Introduction

This section compares the similarities and differences of Information Technology presence and usage by the cases involved in this study. This section will be presented in the different sub themes of this research as follows: the overall perception of the usage and presence of Information Technology, the types of Information Technology tools used by the cases involved in this study, the disadvantages of the usage and presence of Information Technology, the problems experienced with the usage and presence of Information Technology and the emerging theme of this research and the impact of the Malaysian culture on the usage and presence of Information Technology in the cases involved in this study.

### 5.2.2 Overall Perception of the Usage and Presence of Information Technology

All of the cases involved in this study state that there is a usage and presence of Information Technology that supports their supplier selection process and their business.

Case A states that, Information Technology tools assist with simplicity, and with fast retrieval of information. Furthermore, Information Technology tools support their procurement team in acquiring information about new products and about potential new suppliers. Case B, similar to Case A states that Information Technology tools are beneficial to their supplier selection process. Information Technology is used to make a more informed decision. Similar to Case B, Case C states that Information Technology is an essential tool for their business and for their supplier selection

decision-making process, where new suppliers are sought out, and information technology allows Case C to rapidly communicate with new and existing suppliers. Information Technology has become an essential tool as information can be exchanged at a fast rate. Similar to Case B, Case C, uses Information Technology tools to assist with making more informed decisions, where information is extracted and suppliers are contacted directly.

Case D, states that Information Technology is used to support a more informed decision. However, unlike Cases B and C, Case D uses Information Technology to support with engineering construction of products for their customers.

Case E also views the use of Information Technology tools to be beneficial and essential. Case E uses Information Technology to make more informed decisions on their new suppliers. Case F, similar to Case B and C, states that Information Technology tools allow them to source information on new suppliers who are not of friend or family association. Additionally, to Case B and C, Case F also states that Information Technology allows for rapid information exchange with new suppliers, which assists in them in competing within the project based industry.

### 5.2.3 Types of Information Technology Tools Used by the Cases Involved in This Study

| Sub theme | Cases | Findings |
|---|---|---|
| **Types of tools used by the cases involved in this study** | **A** | Google, Alibaba, Mobile Applications |
| | **B** | Google, Alibaba, Whatsapp |
| | **C** | Google, Alibaba, Whatsapp, Kao Kao Talk, Skype, Line, Mobile applications |
| | **D** | Google |
| | **E** | Google |
| | **F** | Google and Alibaba |

*Table 5.4 The above table derives from empirical data. The Table summarises the information technology tools used by the cases involved in the study to support the supplier selection decision making process.*

Case A states that Google, Alibaba.com and mobile applications are all used to source new suppliers and information about new products or requirements. Case B states that in Malaysia, Whatsapp is used as a form of Information Technology tool to support in managing various suppliers, and to support their communication with their suppliers. Case B also states that Whatsapp supports different types of media exchange which enables them to exchange information with new and existing suppliers. Case B uses Alibaba.com as a method to source new suppliers and information about products. Case C identifies Google as a tool used to support their decision-making. Case C also states that Alibaba is used, to source information about new suppliers or new products but Google is used to contact suppliers directly. Case C, identifies Information Technology tools differently to Cases A and B. These tools are Skype and Kakao Talk. These tools are used to communicate with suppliers locally, regionally and internationally and they allow Case C, to acquire information at a rapid speed. It is also stated by Case C, that emails are also used but, due to the volume of emails received, sometimes emails can be overlooked. Although, with the use of these tools, the chance of these emails being overlooked has decreased.

Case D, is similar to Cases A, B, and C, where Google is used to source information on new suppliers and about requirements for their products. However, unlike Cases A, B and C, Case D did not state any other Information Technology tools used to support their process. In section 6.1.2, Case D states their suppliers are sourced through more reliable and valid sources, such as professional associations, unlike Case A, B and C.

Case E uses Google as an Information Technology tool to support their supplier selection decision-making process, similar to Cases A, B, C and D. Unlike Cases A,

B, and C, Case E did not identify any other tools, such as mobile communication applications or Alibaba.com.

Case F, similar to Cases A, B, C, D and E states that Google is used as an Information Technology tool to support their supplier selection decision-making process. Google allows Case F to make more informed decisions, as they are able to acquire information on their suppliers and eliminate false suppliers and inaccurate information. Additionally, similar to Cases B, C, and D, Case F uses Alibaba.com, but does not contact suppliers directly like Case A.

### 5.2.4 Existing Problems with the Usage and Presence of Information Technology Tools

This section compares the findings for the cases involved in this study for the problems or issues experienced with the usage and presence of Information Technology tools in Malaysian manufacturers.

The following table indicates a brief summary of the issues or problems experienced within the cases. The chapter will be presented under the headings of each issue.

| Problems or issues experienced with existing systems |
|---|
| **Inaccurate Information** |
| **No IT support** |
| **Technological concerns** |
| **Manual system or no ICT Presence** |
| **Technological concerns** |

*Table 5.5 The above table is derived from the data collection of this research. The table shows the current issues or problems experienced with the usage and presence of information technology in the cases involved in this research.*

#### 5.2.4.1 Inaccurate Information

In this section, inaccurate information is noted as an issue or problem identified by Cases A, B, C, and D.

Case A states that although Information Technology tools are beneficial to their business and their supplier selection decision-making process, their use does not eliminate the issue of inaccurate information from suppliers.

Similarly, to Case A, Case B also supports that Information Technology tools, whilst they are beneficial, require the intervention of humans to support informed decision-making.

Case C supports that incorrect information is widely available from using methods such as Google.com and Alibaba.com. Case D has encountered false advertisements on Alibaba.com, hence their reluctance to use these tools in their supplier selection decision-making process. Case D is more inclined to use methods where company validity can be identified. Case F did not report any findings, being more inclined to use family or friend association in their new supplier identification.

#### 5.2.4.2 Lack of IT Support

Case A has identified another issue as lack of IT support for some suppliers. The other cases in this study do not mention this as a problem or issue.

Case A states that in some cases their suppliers do not use any Information Technology tools to support their business. In some cases, these suppliers do not have a website. These suppliers are wholly manual, resulting in issues with

communication between the supplier and Case A, incorrect information and a lack of information gathered on the potential supplier; resulting in an uninformed decision.

#### 5.2.4.3 Technological Concerns

Technological concerns are highlighted as an issue experienced by cases A, C and F.

Case A compares the state of technology used in Malaysia to other countries, and states that the usage and presence of Information Technology is much lower.
It can be noted that this issue or problem is an impact of the Malaysian culture, which will be discussed later in this chapter.
Case C, similar to Case A, also identifies technological concerns as an issue arising with the presence and usage of Information Technology tools in Malaysian manufacturing. Case C states that there is a knowledge gap with some employees regarding technology, and in some cases, these employees are encouraged to learn to use technologies such as WhatsApp, Kakao talk, and Skype. Case C, explains the difference in the generations using different technologies, and mentions that technology is advancing at a rapid rate. Case C also explains their usage of alternative communication methods such as WhatsApp, in explaining that emails are unmanageable and communications are missed, so emerging technologies have supported communication with their suppliers.
Case F identifies technology to be inflexible to their needs, similar to Case A, Information Technology tools promote inaccurate information and still require a human to make informed decisions; hence their decision to use traditional methods of identifying new suppliers.

### 5.2.5 The Impact of Malaysian Culture on the Usage and Presence of Information Technology in Malaysian Manufacturing

This chapter presents the emerging theme - the impact of the Malaysian culture on the usage and presence of Information Technology in Malaysian manufacturing. This chapter will discuss and compare the similarities and differences within the cases involved in this study.

#### 5.2.5.1 Financial Concerns

Financial concerns are viewed as one of the issues arising for the emerging theme of this research. Case B states that Malaysian SMEs are unwilling to spend money on technology that they are unable to justify. In some cases, some suppliers are still manual, whereby there is no usage or presence of any Information Technology used by their company. For some suppliers, it is viewed that as the manual system works, there is no need for advancing to technology, due to the cost.

Case E also mentions financial concerns as an issue experienced for the emerging theme of this research. Case E states that there are suppliers who are completely manual and they view technology as a waste of money as they do not see the need for it. These suppliers view their current methods to be adequate and fitting to their needs.

#### 5.2.5.2 Malaysia

Case A and Case C state that there is a difference in the way business is conducted in Asia, including Malaysia, compared to the Western hemisphere. Case A states that Malaysia and other South East Asian countries are more customer-oriented compared to the Western hemisphere, being process-oriented. In Malaysia, the use of

Information Technology tools is used to create different methods of communication, between the supplier – buyer relationship. For instance, the use of mobile communication tools such as WhatsApp and Kakao talk, as these applications allow informal discussion, to be formalised at a later time. These methods are not seen to be part of the process in the Western hemisphere. The South East Asian market tries to accommodate business and the needs of their customers.

### 5.2.6 Conclusion

This section compares the presence and usage of Information Technology tools in all cases involved in this study. This section highlights the different methods of Information Technology tools used, the problems and issues experienced, the emerging theme and the impact of the Malaysian culture on the presence and usage of Information Technology by Malaysian manufacturers. The following chapter will compare the usage and presence of Business Intelligence tools in Malaysian manufacturers.

### 5.3.1 The Usage and Presence of Business Intelligence Tools in Malaysian Manufacturers

This section will compare the usage and presence of Business Intelligence tools within the cases involved in this study. This section will compare the following topics: the overall perspective of Business Intelligence tools, the types of Business Intelligence used, the problems or issues experienced and the emerging theme and the impact of Malaysian culture on the usage and presence of Business Intelligence tools in Malaysian manufacturers.

#### 5.3.1.1 The Overall Perspective of the Usage and Presence of Business Intelligence Tools in the Cases Involved in This Study

All of the cases involved in this study state that the use of Business Intelligence tools is beneficial to their supplier selection decision-making process.

Case A states that Business Intelligence tools are beneficial for capturing information about past purchases and for unifying departments in their business for a seamless process. Case B states that their Business Intelligence tool supports informed decision-making. Information on their suppliers is organised and access to historical data is available. This is used for cross-referencing and monitoring cost of materials. Case C is similar to Case A, in stating that the incorporation of Business Intelligence tools, allows for the merging of different departments for seamless operations, whilst Case D, is similar to case B in stating that they are able to access past decisions, for a more informed decision. Also due to the nature of the business of Case D, technical drawings can be stored, for future usage, saving them time. Case E states that the

use of Business Intelligence tools allows for reporting and to unify departments locally, regionally and internationally.

Case F is similar to the other cases in this study as Case F uses Business Intelligence tools to store past jobs, technical drawings, and supplier details. This makes it easier to access this information and to be more time-efficient, but does not mention the unification of departments as with Cases A, B, C, and E.

### 5.3.2 The Types of Business Intelligence Tools Used by the Cases Involved in This Study

The following table briefly represents the Information Technology tools used.

| 8.2 Types of Business Intelligence tools used. |
| --- |
| 8.2.1 Microsoft Excel |
| 8.2.2 SAP |
| 8.2.3 SQL |
| 8.3 MAP |
| 8.4 SQL |
| 8.5 Auto Count |
| 8.6 Epicor |
| 8.7 Side-lines |
| 8.8 Oracle |

*Table 5.6 This table derives from the empirical findings of this research. This table states the Business intelligence tools used by the cases involved in this research.*

#### 5.3.2.1 Microsoft Excel

Microsoft Excel (MS Excel) is identified as the most commonly used Business Intelligence tool used in all of the cases involved in this study.

Case A states that MS Excel is used to keep track of supplier information. Case A has used various Business Intelligence technologies in the past, but always use MS Excel

as an up to date backup. Their MS Excel databases are not accessible by all departments; each department creates and maintains the specific data relevant to their department.

Case B states that MS Excel is used to support their business, MS Excel is viewed as being simple and easy to use by their employees and does not require training for staff.

Similarly, Case C also states that MS Excel is used as “back up” to their other programs. MS Excel is also used in conjunction with other programs, which will be explained later in this chapter. MS Excel allows for flexibility and reliability.

Case D, similar to Case C, uses MS Excel to support their business including the supplier selection decision-making process. MS Excel also supports other programs used by Case D. Case D also states that MS Excel is versatile and performs may functions, which allows them to eliminate costs of purchasing other Business Intelligence tools.

Case E, although different to the other cases involved in this study, still uses MS Excel to support their business functions. Case E utilises one of the functions of MS Excel to calculate different percentages and differences. However, Case E does not use Excel as one of their main Business Intelligence tools.

Case F, similar to Case A and C, uses MS Excel to support their business, but MS Excel is used as a form of “back up” for their other Business Intelligence tool used, which will be discussed later on in this chapter.

#### 5.3.2.2 SAP

Case E is the only case in this research who mentions the use of SAP. The other case involved in this study states other Business Intelligence tools used to support their business and their supplier selection decision-making. SAP in this case is used to extract information for reporting purposes. However, Case F states that SAP is no longer in use; Case F is using another internal system.

#### 5.3.2.3 MAP

Case F has identified MAP as their supporting Business Intelligence tool, used to support their business. MAP is viewed as being flexible and adaptable to the many needs of different businesses, where functions can be removed and added. The other cases in this study did not identify MAP as a program that is used.

#### 5.3.2.4 Autocount

Case C states that the Business Intelligence tool used to support their business function is a Malaysian developed program called Autocount. The features of this program can be amended to meet the needs and requirements a specific company. It is also stated that Autocount has the appearance of MS Excel, which allows ease of usability for their users.

#### 5.3.2.5 Epicor

Case A states that the Business Intelligence tool called Epicor is used to support their business function. Case A is the only case involved in this study that highlights this program. Case A states that in the past SAP was used, however due to its lack of

flexibility, regarding it's functions, a change was made to Epicor. This program allows for all of their departments to view and amend information unlike SAP.

#### 5.3.2.6 Sidelines

Case B states that the program used to support their business is an enterprise resource-planning (ERP) tool called Sidelines. This program is chosen as it is Windows-based, which promotes accessibility to their users, and the main function this program allows is that users are able to access the system remotely through a secure connection.

### 5.3.3 Problems with the Business Intelligence Tools used with the Cases Involved in This Study

This section discusses the different problems or issues experienced with the usage and presence of Business Intelligence tools amongst the cases involved in this study.

The following diagram depicts and highlights the issues stated in the cases.

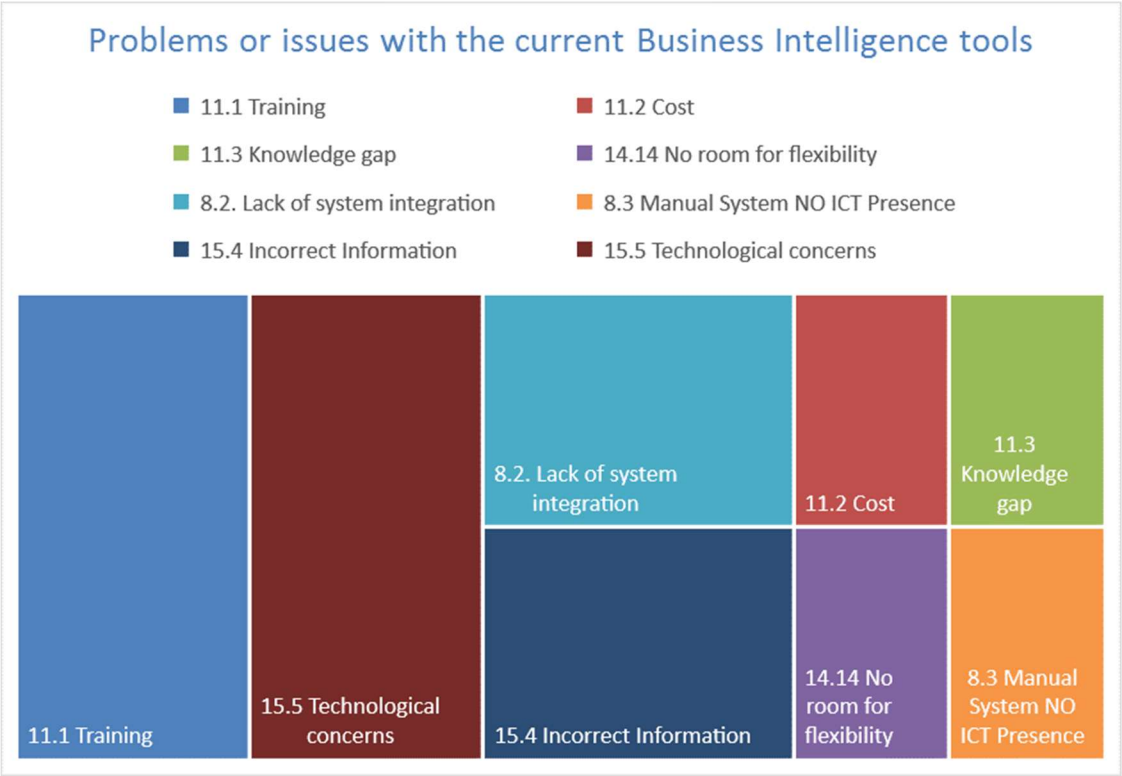


*Figure 5.4 The figure derives from the empirical research of this study. The diagram shows the different problems or issues faced with the presence and usage of business intelligence tools with the cases involved in this study.*

#### 5.3.1.1 Training

The above figure states that training has been the most highlighted issue amongst the cases involved in this study. Cases A, B and E state that their employees require training to use the selected Business Intelligence tools.

Case A states that a series of training is being provided to their staff as a new system was implemented (Epicor). One of the reasons for choosing the system, is to allow all departments in Case A to use the same system. Previously, the other Business Intelligence tools used did not allow this function. However beneficial to Case A, a lack of knowledge or usability is now an issue. Case B also implemented their current

system for the integration purposes as Case A, and similar to Case A, Case B faces the same issue of lack of knowledge of the usage of the new system. Training is being provided to the users. Case E also states that training has been highlighted as an issue with their Business Intelligence system. Unlike Case A and B, Case C devised their own Business Intelligence program, which requires training for new employees. In addition to this, training sessions to all employees are available when required.

The other cases did not highlight training as an issue or problem. This can be a result of Case C and F stating that their Business Intelligence program is made to appear as MS Excel, which is more user friendly, and Case D uses MS Excel to support their business.

#### 5.3.1.2 Cost

Case B has identified cost, along with the presence and usage of Business Intelligence tools, as a problem or issue. The other cases involved in this study did not mention cost as one of their problems. Most of the cases have identified reliability, flexibility and usability as key factors with the implementation of a Business Intelligence system. However, Case B states that cost of the Business Intelligence system is affected by taxes in Malaysia. This is one of the factors that dissuades some companies from the implementation of Business Intelligence programs.

#### 5.3.1.3 Knowledge Gap

An issue highlighted by Case A, is a limitation of users, as they are aware that it is a new system, they have a reluctance to use it. Case A has provided training to eliminate this knowledge gap.

The other cases in this study did not identify knowledge gap as a problem or issue with the presence and usage of Business Intelligence tools.

#### 5.3.1.4 Lack of Flexibility

Case B highlights the issue of lack of flexibility for the usage and presence of Business Intelligence systems. Case B states that some Business Intelligence tools only allow for certain modules (like SAP), and this factor makes it unsuitable for Malaysian manufacturers. Some programs do not meet the needs and requirements of their business and processes. In many cases, to meet this need, other programs are used, but present a problem of lack of integration amongst departments.

#### 5.3.1.5 Manual Systems

Case E highlights that manual systems present an issue with the usage and presence of Business Intelligence tools. In some cases, suppliers are manual, and do not have any support from Business Intelligence tools. This promotes a slow rate of information sharing and in some cases inaccurate information.

Case E states that these suppliers do not see the need for spending money on Information Technology tools or Business Intelligence tools.

### 5.3.2 The Impact of the Malaysian Culture on the Usage and Presence of Business Intelligence Tools

This section will describe the impact of the Malaysian culture on the usage and presence of Business Intelligence tools for the cases involved in this study.

Case A states that the use of Business Intelligence tools is beneficial. However, due to the Malaysian culture, these tools are viewed as unnecessary. These tools are used

to support the retrieval of information already stored, but not with the decision-making for new suppliers. In Malaysia, businesses prefer to make new partnerships by face-to-face interaction, unlike in the Western world. Malaysian manufacturers prefer to have informal and formal meetings with new customers. These tools may support this in some cases, but in other cases, family and friend association is viewed as a more reliable source.

Case C states that there is preference for Malaysian manufacturers to use Business Intelligence tools designed for Malaysian businesses. Case C compares Western software, such as SAP, to their currently used system Auto count. Case C states that systems like SAP are too complicated and do not support the needs of Malaysian manufacturers.

Case F, similar to Case C, states that their Business Intelligence program is also developed in Malaysia for Malaysian business users. Case C also states that most Malaysian companies prefer to use local software because other Western software is too complicated and not suitable for Malaysian manufacturing. Some Western software is not flexible to the needs and requirements of Malaysian manufacturers, whereas Malaysian software can be changed and designed for the needs of a specific customer. Case F states that Malaysian software developers understand that for each Malaysian manufacturer, their nature of business is different and their outcomes are different, so programs are designed for this reason.

### 5.3.3 Conclusion

This section of the chapter discusses and compares the presence and usage of Business Intelligence tools amongst the cases involved in this study. This section provides a comparison with the overall perception of Business Intelligence tools, the types of Business Intelligence tools, the problems or issues faced with usage and presence of Business Intelligence tools and the impact of Malaysian culture on the usage and presence of Business Intelligence tools on Malaysian manufacturers. It can be concluded that some cases in this study use both Malaysian manufacturing software for flexibility and other cases in this study also use Western software, but still face issues with lack of integration and training for their staff. These issues will be discussed further in the discussion chapter of this thesis.

The following section will discuss and highlight the usage and presence of artificial intelligence amongst the cases involved in this study.

## 5.4 The Usage and Presence of Artificial Intelligence Tools Within the Cases Involved in This Study

### 5.4.1 Introduction

This section of the chapter will discuss the usage and presence of Artificial Intelligence tools amongst the cases involved in this study. The chapter will discuss the overall perspective of the usage and presence of Artificial Intelligence tools, and the types of Artificial Intelligence tools used amongst the cases.

#### 5.4.1.1 The Overall Perception of the Usage and Presence of Artificial Intelligence Tools

In this research one of the main themes explored was the usage and presence of Artificial Intelligence tools used by Malaysian manufacturers to support their supplier selection decision-making process. However, it is found that none of the cases involved in this study uses Artificial Intelligence tools to support their supplier selection decision-making process.

Case A states that there is no knowledge of what Artificial Intelligence tools are and therefore there is no presence of this in their business.

Cases B, C, D, E and F also state there is no knowledge of Artificial Intelligence tools and that this not relevant for Malaysian manufacturers.

It can be noted that the overall perception of Artificial Intelligence tools for the cases involved is that this tool is irrelevant to Malaysian manufacturing and is not used.

It can also be stated that no Artificial Intelligence tools are used by the cases in this study to support supplier selection decision-making.

#### 5.4.1.2 Conclusion

This section discusses the usage and presence of Artificial Intelligence tools to support supplier selection decision-making in the cases involved in this study. It can be stated that no Artificial Intelligence tools are used and in some cases, there is no knowledge of Artificial Intelligence tools.

# Chapter 6: Discussion / Interpretation of Findings

## 6.1 Introduction

This chapter seeks to discuss the key findings generated by the study, which are presented and summarised as a revised conceptual model. These findings are compared and contextualised alongside prior studies.

## 6.2 Revised Conceptual Framework

Chapter 2, presents a conceptual framework as the foundation for this research. This is developed as a result of a multi-disciplinary literature review in four main subject areas: supplier selection decision-making process, Information Technology tools, Business Intelligence tools and Artificial Intelligence tools.

The revised conceptual framework (Fig 6.1), integrates the main findings of the emerging themes of the study. The revisions to the framework stated in Chapter 2, derive from in-depth interviews with procurement managers in Malaysian SME manufacturing companies, and after theoretical saturation was reached at the thematic coding process as explained in Chapter 3.

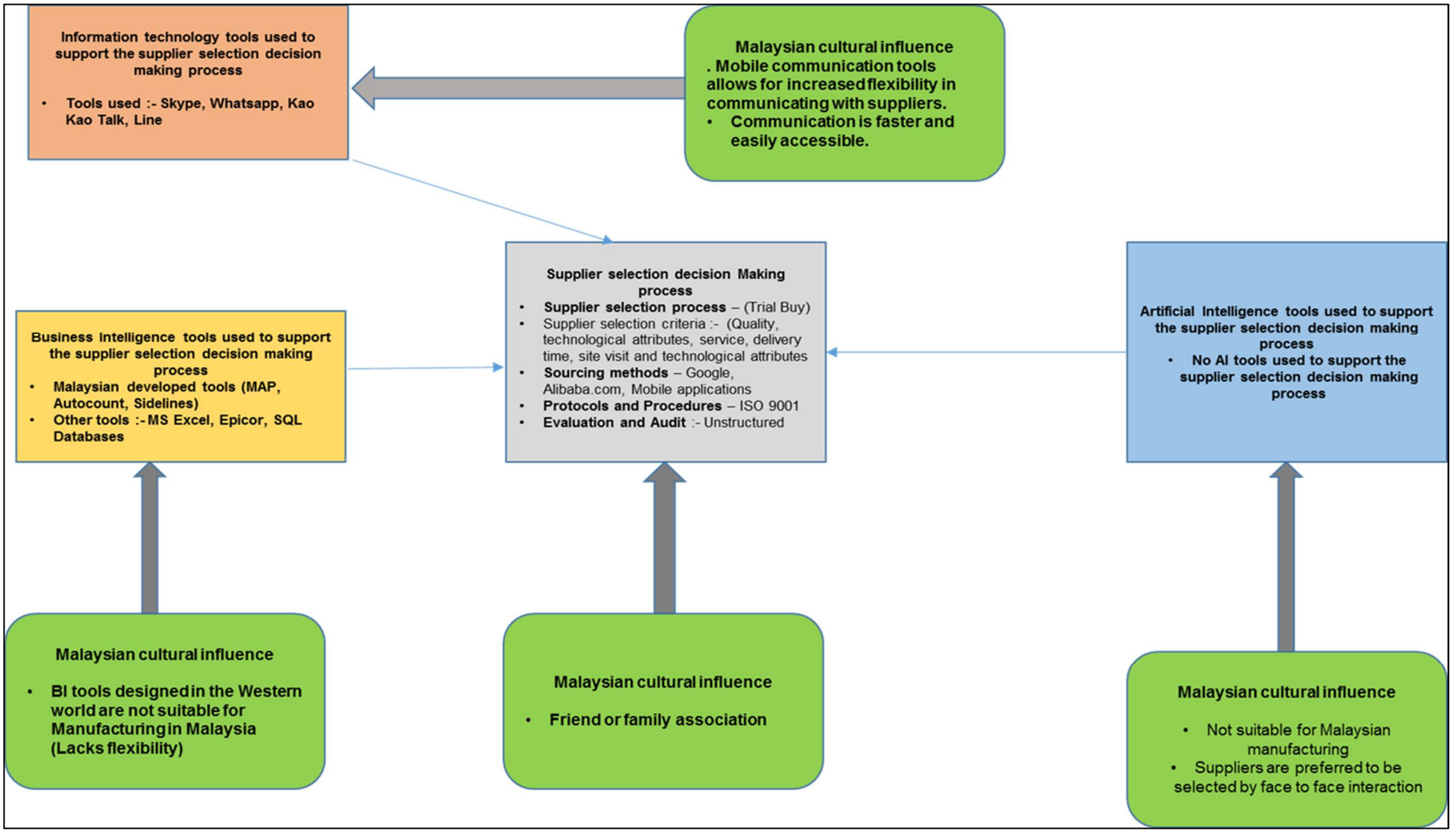


*Figure 6.1 Revised conceptual framework, integrating the empirical findings.*

## 6.3 Supplier Selection Decision-Making Process

### 6.3.1 Supplier Selection Process

The supplier selection process stands as one of the first and most important processes to the supply chain (Harwood, 2009) and is agreed upon by the six cases involved in this study.

Amongst the cases in this study, the trial buy process is the most used. The suppliers are sourced, a purchase is made, and the supplier is then assessed using the delivery time, quality and pricing criteria to assess if the supplier is suitable for the firm.

Case A states that the trial buy method is used, and this method allows assessment of the supplier, using delivery time and quality. Similar to Case B, where the trial buy method is also used, and the supplier is assessed on quality and delivery time. Case C also uses the trial buy method; using quality, pricing and delivery time as a measure. Case D assessed their new supplier on technical ability and pricing, whereas Case F, similar to case B and C, assessed their new supplier on quality and delivery time. Although applying a method constructed by practitioners and past research, the cases involved in this study show an unstructured process. An interesting finding, is what happens to suppliers after the selection process is complete. Some cases place the newly selected supplier on their list and will only use them when needed, and some will never be used at all.

The literature supports that Malaysian manufacturers have undergone a transformation with regards to their supplier selection process, whereby unstructured processes were sought to be the most common amongst companies of this size. This was due to word of mouth or the family and friend association factor impacting on the

supplier selection process. However, literature states that the evolution of the supplier selection process in Malaysian manufacturers has noticed the benefits of having multiple channels of supplier sourcing, as they are provided with different supplier options for different products. It can also be noted that all of the cases in this study still use the word of mouth affiliation, but only two cases, namely case D and F, still refer to family and friend association for their suppliers.

### 6.3.2 Supplier Sourcing Methods

The six cases involved in this study used the Internet and word of mouth as the most common method of locating and sourcing suppliers. An interesting finding for this theme, is the use of the global marketplace method, Alibaba.com.

The relevant literature states that manufacturing companies usually source their potential suppliers by the use of magazines and exhibitions (Hadi and Mastor, 2005). However, it can be compared to the findings of this study that the use of magazines and exhibitions are not the most common method used to seek out new suppliers.

Keivan and Shahgholian (2012), identify that some Malaysian suppliers also use directories, or for the purpose of this study, yellow pages, and trade associations or professional associations. These methods are represented in the findings. However, these methods are not as commonly used as the Internet and word of mouth method as commonly highlighted in the research findings.

Moreover, Arbuthnot et al., (1993) identifies the information sources used to make supplier selection decisions; these methods include personal judgement, customer

comments, salespeople, exhibitions and trade shows, consultation with other buyers, trade publications, seminars and workshops and resident buying offices.

However, it can be stated that exhibitions, trade shows, yellow pages, green books, advertisements and telephone calls can be viewed as traditional methods to approach supplier selection.

Hazra and Mahadevan (2006) states that firms are now faced with a multiple supplier environment, which encourages competition for most suppliers, and firms are seeking a supplier to provide them with the best quality, delivery time and price. Due to this, global market places exist to enable firms to seek the best supplier locally, regionally and internationally. Although there are disadvantages, such as, that site visits are not always possible.

The findings have identified Alibaba.com as a form of supplier selection, this tool has allowed businesses to seek suppliers, locally, regionally, and internationally, and in some cases also state that additional checks are made to verify the supplier, and this is highlighted as the most preferred method.

It can be noted, that in most of relevant literature, the focus is placed on other South East Asian countries, such as China and Japan. It is highlighted that there is a gap with research in Malaysian manufacturing industries in this area.

The word of mouth method is identified as one of the other preferred methods of supplier sourcing or locating. In the case of Malaysian manufacturing, word of mouth relies on trust from a known colleague, friend or family member.

The relevant literature in this area, has related “word of mouth” to trust and relationship building. Discussions regarding this expect competence, communication, and conflict

handling that would have direct association with trust and the relationship quality (Ndubisi et al., 2004).

It can be stated that this research project does not incorporate trust as a component of the research findings. However, it can be noted that the findings indicate that some of the cases involved in this study, use this method, due to trust.

Mobile applications can be viewed as another main finding in this research. As highlighted in Chapters Five and Six, the use of mobile applications is used to source new suppliers.

The applications highlighted were ECCM or the EC2 mobile application. As previously stated, these mobile applications are used to source a specific type of product, for the cases involved in this research. In instances where suppliers cannot be sourced from the other methods discussed in this chapter, these mobile applications are used.

The relevant literature in this field does not mention mobile applications as being used as a source for suppliers.

In conclusion to this section of the chapter, it can be noted that the cases involved in this study use a wide array of methods to source or locate their suppliers. Each case has identified more than one method. The relevant literature in this area supports the cases in this study, as each case uses a multiple supplier environment, to seek the most appropriate price, quality and delivery time. The findings also indicate that in all of the cases, the Internet and Internet tools are used to support supplier selection. Alibaba.com and mobile applications are identified as being used to provide a different method or platform to source suppliers, and are more commonly used as compared to “traditional methods” found in this study. The relevant literature in this area shows

a defined gap in the use of mobile applications and the use of global marketplaces in Malaysian manufacturing.

The following section will discuss the supplier selection criteria used by the cases involved in this study.

### 6.3.3 Supplier Selection Criteria

In this section, the most pertinent supplier selection criteria identified by the cases involved in this study, compared to the relevant literature, will be discussed.

As already established earlier in this chapter, the supplier selection process is one of the most critical and important processes and practices in the supply chain. Moreover, the study of supplier selection criteria is also viewed as another relevant research area. As stated in the literature review of this thesis, many studies including Dickson 2003, O'Shaughnessy and Lehman, (1982); Paulo et al., (2012); Caddick and Dale (1998); Patil (2014); have all conducted studies on supplier selection, and have not found a standardised supplier selection criteria list of pertinences. However, the main supplier selection criteria that has always been highlighted as being pertinent are quality, pricing and service.

In comparison to relevant literature in this area, this study highlights ten (10) main criteria significant to the cases involved, which can be a reflection on other manufacturers within the same nature of business in Malaysia.

Similar to the relevant literature, quality is highlighted as one of the important criteria highlighted by the cases involved in this study and is also criteria that cannot be compromised. A reason for having a multiple supplier environment is to ensure quality

of goods or services by the cases involved. Additionally, the cases in this study also rely on quality to upkeep and maintain their reputation and to ensure their place within their competition.

Pricing or cost is also referred to in the literature as being another important criteria for manufacturers in all firms. Moreover, the findings of this research also indicate that cost or pricing is also an important criterion in the supplier selection process.

O'Brien and Ghodsypur (1998), states that cost criterion will have a considerable effect on the supplier selection parameters. For this research, the cases involved in have all put into practice a multiple supplier environment to meet this need.

Although the relevant literature in this field identifies the main supplier selection criteria to be quality, pricing and service, this study shows that the main criteria identified by this study are quality and cost.

Service is highlighted, and the findings indicate the cases are aware that service is important, but is applied to a different level of priority, which differs from relevant research in this area.

In this research, the two other prevalent supplier selection criteria are identified as "site visits" and "technological attributes".

In the case of this study, site visits are viewed as important. This can be a result of the different methods used to source new suppliers.

The cases often mentioned site visits when referring to problems and issues experienced in the supplier selection process. In many cases, there were issues with the validity of the supplier, thus site visits are viewed as important.

The relevant literature, does not mention site visits as one of the main supplier selection criteria. It can be stated that site visits can be a finding in the case of Malaysian manufacturing companies.

Technological attributes are also identified as a strong supplier selection criterion in this research. The position of the four stronger supplier selection criteria in Malaysian manufacturing in contrast to the literature, which considers the most pertinent supplier selection criteria to be service, cost and quality (Hadi and Mastor, 2005), differs by highlighting the cost, quality, technological attributes and site visits.

Moreover, studies conducted by Barbarosoglu and Yazgac (1997), introduce three different primary criteria: the performance of the supplier, the financial situation of the supplier, quality and technical capabilities. The finding of this research highlights financial stability as important supplier selection criteria.

Financial stability is related to manufacturing literature due to the importance of selecting a supplier that does not depend on one source to conduct business. The cases in this study represents this in the findings.

To conclude this section of the chapter, the supplier selection criteria is viewed as an integral process of Malaysian manufacturing. The relevant literature states that the most pertinent supplier selection criteria are identified as cost, quality and service. However, the findings of this research highlight similarities and differences alike, whereby site visits and technical attributes have precedence over service. It can also be noted that availability, reliability and environmental are also highlighted in this study.

These three supplier selection criteria did not appear as typical criteria for the manufacturing companies in Malaysia, However, the relevant literature in the area, mentions availability and reliability in the twenty-three (23) criteria (Dickson, 2003).

### 7.3.3 The Decision Makers

When discussing the supplier selection decision-making process, it can be important to shed light on the supplier selection decision-makers. This aspect not only contributes to this research, but is relevant to practitioners, as to highlight different company structures and decision-makers.

The relevant literature in this area, does not clearly define the decision-makers in Malaysian manufacturing firms. The decision-makers are referred to as operations or logistics or in some cases the “purchasing function”. Haq and Kannan (2006) also state that “purchasing function”, is one of the most important roles in the selection of the most appropriate supplier as it brings significant savings for the organisation. The decision-makers in this study also understand the important role of decision-making, as they will identify the most relevant supplier to meet the needs of their organisation. Although, six different categories of decision-makers have been identified, they are all committed to acquiring the necessary information required to select the most appropriate supplier. These six different classifications of decision-makers apply the practises and protocols of their relevant firms and do not compromise, to result in finding the best supplier for the firm.

They are also responsible for carrying out the supplier selection evaluation process. This process will be discussed in the following section of this chapter.

### 6.3.4 Supplier Evaluation or Audit Process

The supplier evaluation or auditing process is a process that is conducted by the decision-makers in the cases involved and by other studies relevant to this area.

The relevant research in this area refers to the supplier evaluation or auditing process as a process that is important to firms so that they can get the best value for their money (Keivan and Shahgholian, 2012). However, relevant literature in this area mentions the supplier evaluation process to be one that is structured, and mentions different methods, including ranking into different levels including certified, preferred and confirmed suppliers (Hadi and Mastor, 2005). Moreover, the evaluation process or auditing process in Malaysian manufacturing, in most cases, benefits the firms. Due to this, there is a lack of a standardised process. However, this is different to manufacturing companies in different regions, where a structured process is undertaken, relative to time frame, and specific criteria (Ellram, 1996).

The cases involved in this study, highlight the evaluation or audit process being undertaken. However the cases in this study do not specify a standardised process between them.

The interpretation of the findings shows the differences in how each case conducts this process. In most cases, the supplier selection criteria of delivery time, quality and service are taken into consideration.

Three cases in this study have devised their own methods, by following from the relevant literature in creating rating scales, and the most common in the cases of this study, using the total expenditure as a method of identifying the suppliers who are going to be evaluated. Relevant literature states that in most cases in Malaysian

manufacturing the criteria that is evaluated would be financial position, capacity, assurance, process, and service (Hadi and Mastor, 2005). Relevant literature states that the evaluation process usually collects vendor evaluation information by conducting questionnaires, and is carried out in five phases (Yeh and Lee, 2014).

The findings show the questionnaire method is only conducted by one case involved in this study; the other cases involved employ the method of evaluation by filtering the frequency of purchases, and by the amount of money spent with a particular supplier. In addition, there is a variance of time amongst the evaluation or auditing process amongst the cases involved in this study. Some cases conduct this process every six months, whilst some on an annual basis and others on a quarterly basis.

It can be noted that the findings for the supplier evaluation process can be a reflection of lack of resources including time or manpower to conduct this process, as supported by one of the interviewees in this research.

It can also be noted that the relevant literature indicates approaches to the supplier evaluation process as mostly quantitative and structured. Also, the criteria used in the supporting literature indicates differences to the cases involved in this study.

In conclusion, the findings for the supplier evaluation or auditing process show differences to the relevant literature. The Malaysian manufacturers involved in this research show different ways of performing this process. The main finding is highlighted as the evaluation process, by filtering the suppliers according to the amount of money spent by the firm, unlike the structured evaluation process stated in the relevant literature.

The following section of this chapter will discuss the protocols and procedures followed by some of the cases involved in this research.

### 6.3.5 Protocols and Procedures

This section highlights the findings of the protocols and procedures followed by some Malaysian manufacturers. These protocols and procedures are a part of the supplier selection decision-making process.

Some of the cases in this study, mentioned their affiliation to the ISO 9001, which is an international protocol that monitors and provides regulation for quality management. For the cases involved in this study, quality is related to the methods by which products are produced, and to upkeep with a certain standard or material used.

The relevant literature confirms that one of the benefits of being an ISO certified company is that they are believed to have conformed to the quality standards required to compete at an industrial level (Nayakappa and Patil, 2014). This can also guarantee suppliers a broadened market for tenders and contracts, and can achieve competitive advantages in the market.

In contrast to the literature, the majority of cases involved in this study are ISO certified, but this is not a requirement for their selected suppliers. The existing relevant literature indicates limitations to the study of the ISO certification to Malaysian manufacturing companies.

The cases involved in the research that state that they are ISO Certified, follow a set of procedures including site visits as confirmed by the existing literature. In addition to

this, suppliers who are ISO certified do not undergo the evaluation process, as they are expected to comply with ISO standards.

The main findings of this section indicate that the cases involved in this study, are not all ISO certified, and the cases that use this procedure use it as a filtering process for evaluation.

Although the relevant literature states that following the ISO 9001 procedure offers competitive advantage, not all of the cases employ this process for supplier selection, or for customer loyalty as suggested.

### 6.3.5 Issues and Problems in the Supplier Selection Decision-Making Process

This section compares the findings of the case studies involved in this study to the relevant literature.

The relevant literature in this area mentions issues and problems experienced in the supplier selection decision-making process and studies by Gonzalez et al., 2004; Gonzalez and Eckleman, 2004, Dickson, 1996; Weber et al., 1996; Vonderembse and Tracey, 1999; discuss the problems and issues surrounding the supplier selection decision-making problem. Although some of these studies are based in the United States of America, some of the issues can be extended to manufacturing in Malaysia. The literature defines the manufacturing issues into the following categories: materials, quality control, supplier process control, supplier documentation systems, supplier management systems, supplier availability and material specification accomplishment. As we compare these categories with the findings of this research project, it can be noted that some problems are similar and some problems are different to that of the literature.

This problem is mentioned by all of the cases involved in this study, as it stems from the supplier sourcing or locating process. The reason for this is that the problem starts with the locating of suppliers through the Internet and other methods used by the cases in this study; for instance the search engines and global marketplaces. Most cases referred to verification techniques to ensure the authenticity of the suppliers. However, this is not mentioned in the above categories as stated in the relevant literature. The literature eliminates this issue as studies have applied more rigid and quantitative methods to eliminate this issue. However, the nature of this research project is of a qualitative nature, whereby the issues are reported and non-mathematical solutions are applied by the cases involved in this study, unlike the literature in the area.

Another important issue highlighted in the findings is quality. Although one of the supplier selection decision-making criterion is quality, this still remains an issue for the cases involved in this study. This can be due to the fact that in some cases, the suppliers are not based locally, and an initial site visit can be completed to test the quality of the material before purchase. Case A of the study, mentions quality to be one of their greatest problems, as most of their materials are imported either regionally and internationally. There is no way to assess quality until the arrival of the material. In relation to the relevant literature, this issue can be classified under the supplier quality policies, as strict policies ensuring consistencies in the quality of raw materials are planned and executed at the early stages (Gonzalez et al., 1990). However, the cases that expressed quality as being an issue, state their supplier selection process to be of the trial buy nature, thus encountering problems after the delivery. There is a lack of strict policy as stated in the literature.

Supplier sourcing is deemed an issue or a problem with the supplier selection decision-making process. Although the cases involved in this study apply a multiple supplier environment, there are still cases where sourcing or locating a supplier is problematic. However, as stated in the case description, this is a rare situation. This factor will also affect the cost of the material, and the time it takes to produce it for their clients. This issue is not mentioned in the relevant literature in the area.

Technical ability is highlighted as a problem faced by the cases involved in this study. This problem is mentioned by two of the cases in the study, who's nature of business manufactures specific products for their clients. In this case their suppliers would need to have special technical knowledge in the materials they require. The relevant literature classifies this issue under the material specification accomplishment, whereby materials should be in accordance to specification, to obtain a good final quality (Gonzalaez et al., 2004).

Location of suppliers is also highlighted in the findings as an issue or problem faced by the cases involved in this study. When speaking of location in this instance, it refers to the location of the supplier and the ability to ensure the quality of the material, and the on-time delivery of the ordered goods. However, in this case, the location of the suppliers appears to be an issue, as the cases in this study frequently source suppliers regionally and internationally. This also shares a relationship with the quality of the materials delivered. This issue presents and unravels many issues and can be classified into the supplier availability issue as outlined in the existing literature (Gonzalez et al., 2004). The knowledge of different suppliers in the market is critical since it is important to choose the supplier with the highest quality materials. Although the literature states the above, Malaysian manufactures are sometimes presented with

few options within their country, resulting in sourcing suppliers regionally and internationally. This affects their delivery times, quality and inventory levels.

Culture is mentioned as another issue. When referring to culture in this study, it refers to the Malaysian cultural influence on supplier selection decision-making. This factor will be discussed in the following section of this chapter.

### 7.2.10 The Effect of the Malaysian Culture on the Supplier Selection Decision-Making Process.

This section discusses the effect of the Malaysian culture on the supplier selection decision-making process. It should be noted that this study does not investigate the Malaysian culture as a theme of the research, but presented itself as an influential factor to the supplier selection decision-making process.

The effect of the Malaysian culture on the supplier selection process arose from the findings whereby, it's influence affected different sub themes involved in the supplier selection decision-making process, including the sourcing of new suppliers, and the supplier evaluation process.

The findings indicate that friends or family affect some decisions through the friend and family association between suppliers and the cases involved in this study, where some cases especially Case F, prefers to conduct business with suppliers who are friends or family or with suppliers who are referred. Case F, states this method affects quality, delivery time, and most importantly pricing.

There is also an element of trust, and an already existing supplier buyer relationship. Also, the friend and family method, also allows for the experience gained by a previous buyer, to share information with another buyer.

The cases in this study have all mentioned the use of incorporating the friend and family association in their supplier selection decision practice.

However, other research areas, including information technology, education, and hospitality and tourism sectors in Malaysia state that the friend or family relationship is used and it is common in Malaysia and other South Eastern countries as a way of doing business.

Case A, in this study mentions the difference in which business is conducted in Malaysia and compares the way business is conducted in the Western hemisphere, in stating that Malaysians conduct business in an informal manner, as compared to the Western hemisphere and this is due to their culture.

### 6.3.6 Conclusion

The purpose of this section was to present the main findings of the supplier selection decision-making process in Malaysian manufacturing. It discusses the supplier selection process, the cases in this study are found to have some similarities and some differences to the relevant literature. However, most of the cases in this study use a trial buy method but in an unstructured manner, as there is no follow up process to the supplier selection process.

The relevant literature states that a multiple supplier environment is most beneficial to firms, as it allows options for suppliers, which can also affect quality and pricing. The cases in this study also illustrate that a multiple supplier platform is used. The main finding for this section would be the usage of mobile applications and the usage of Alibaba.com. It also can be noted that the use of Alibaba.com can be an influence of the Malaysian culture. The cases in the study also employ the use of untraditional and traditional methods as defined in section 7.2.4, whereby the traditional methods are sometimes used to verify information acquired from traditional methods. The chapter then discussed and compared the supplier selection criteria responsible for the decision-making, and it is shown that it varies from the relevant literature in this area, for various factors, including the relevant literature that presents a general overview of supplier selection criteria for Malaysian manufacturers. Also, some of the relevant research is gathered from secondary data, whilst the findings of this research derives from primary research.

The section then defines the decision-makers in the cases, and can be used as a classification of the decision-makers in Malaysian manufacturers. The chapter then describes the supplier evaluation process for the cases involved in this study and compares this to the relevant literature. It can be noted that the supplier evaluation process undertaken by the cases in this study are unstructured, unlike the nature of the supplier evaluation process described in the literature. The findings highlight limitations in staffing to conduct the process, and relies on external processes to shorten the supplier evaluation process. The findings also indicate a lack of structure with regards to the supplier selection criteria used to evaluate or audit the cases. The evaluation process also displays a lack of structure as there is no similar frequencies when the evaluation process is conducted with each other and to the relevant literature

in the area. The problems and issues are also described and compared to the relevant literature in the area, and show that some of the issues are similar to the relevant literature, and some problems or issues are specific to Malaysian manufacturing, presenting another gap in the literature.

Finally, the effect of the Malaysian culture is discussed. However, there is a lack of relevant literature in this area. The findings indicate that the cases in this study have a preference to be referred by, or conduct business with, friends or family in Malaysian manufacturing. This can be for many reasons, including trust, and relationship-building. However, although the research did not investigate cultural influences, as this was not a part of the study, it did present itself as a relevant finding.

The following section of this chapter will discuss and answer the second research objective of this study and the usage and presence of Information Technology in Malaysian manufacturing.

## 6.4 Information Technology Presence in Malaysian Manufacturing

### 6.4.1 Introduction

This section highlights the Information Technology tools used by the cases involved in this study, and is compared with the relevant literature. This section will be presented in the following sections: the overall perception of the usage and presence of Information Technology, the different types of Information Technology tools used to support the supplier selection decision-making process, the problems or issues experienced by the usage and presence of Information Technology and the impact of the Malaysian culture on the presence and usage of Information Technology.

### 6.4.2 The Overall Perception of the Usage of Information Technology Tools to Support the Supplier Selection Decision-Making Process

The overall perception of the usage and presence of Information Technology tools to support the supplier selection decision-making is viewed as being beneficial to the cases involved in this study. The cases state that Information Technology has simplified their search for new suppliers, assists in promoting the integration of departments locally and also allows for international access, providing the cases with a method to source information about customers and new products, and is most commonly known for its speed in accessing information using various tools.

Additionally, the cases use Information Technology tools to perform various functions throughout their firms, including report generation, supporting their research and development teams, and viewing historical information about past purchases with their suppliers. Information Technology is viewed as a strategic tool for the cases involved in this study. Similar to the relevant literature, the presence and usage of Information Technology tools is viewed as a necessity to manufacturing firms, as it can be used as a strategic tool to improve their goals and objectives (Hewitt, 1994).

An integral point made by cases in this study, is access to information and the time it takes to retrieve information, and the use of Information Technology tools allows these cases to access and retrieve information at a desired rate. Hadi and Master (2005) support that the use of Information Technology tools can lead to a reduction in the supply chain lead time, as firms are able to access information and retrieve information at a desired rate. It can also be noted, that the cases involved in this study have implemented technology to improve the flow of information and improve communication with their suppliers as supported by Sonmez (2006).

One of the cases involved in this study mentions their usage of an E procurement tool. For this case it is important to have access to information internationally, and the usage and presence of Information Technology tools allows for this feature. The relevant literature in this area supports that the world is becoming a global “village” through Internet technology and there has been an obvious growth in the interchange of Information Technology in the last two decades in the manufacturing industry in Malaysia (Sonmez, 2006; Ndubisi et al., 2007). This is reflected in the cases involved in the findings of this study; there has been an improvement and growth in the usage and presence of Information Technology tools, where information tools are used to support, not only the supplier selection decision-making process, but also other business and process functions of the cases involved in this study.

In conclusion, this section indicates the perception of the usage and presence of Information Technology tools in the cases involved in this study. The following section will highlight and compare the Information Technology tools used to support the supplier selection decision-making process.

### 6.4.3 Types of Information Technology Tools to Support the Supplier Selection Decision-Making Process

This section of the chapter will compare the Information Technology tools used by the cases involved in this study, with the relevant literature in the area.

One of the cases in this study highlights the usage of Internet bidding and Internet negotiations, which are all processes under E-procurement. It can be noted that this company uses E-procurement processes due to the nature of their business, as this case is a subsidiary of an international company. Due to this, access to information and to the company system is necessary to the case.

Thiruchelvam and Tookey (2011), state that E-procurement has changed the way in which procurement is done, and firms benefit from improved efficiency, reduced transactions and production costs. However, SMEs like the cases involved in this study still perceive E-procurement to be unfeasible due to finances. SMEs still lack the comprehensive technology standards to implement systems. Hence Case E of this study, although existing as an SME in Malaysia, still adopts the technology standards from its parent company. It can be noted that the Information Technology presence differs from the other cases in this study.

The findings of case A, B, D, E, and F, in this study unlike case C, includes the internet, search engines and communication tools such as: Whatsapp, Line and KakaoTalk as information technology tools."

For these firms, the other emphasis on the use and presence of Information Technology, besides the access and retrieval of information, is the ability to communicate.

Communication between the cases and their suppliers is found to be of great importance. These applications are used to initiate communication with their suppliers locally, regionally, and internationally at no cost to either the procurement teams or the suppliers involved in the transaction. An interesting finding, highlighted in the cases involved in this study, is their preference to have informal communications with their suppliers, as it is believed to promote better relationships. Tools like Whatsapp, Line, Skype and Kakao talk, provide another platform for informal discussions and transactions to occur, for the cases involved in the study. All of these technologies are mobile phone applications that can be used at any time by both parties.

Case C mentions, that although E-mails are used, sometimes E-mails are overlooked and business opportunities are missed. It can also be noted, that the findings have presented a different form of communication in Malaysian manufacturing, which removes communication barriers between buyers and suppliers.

The relevant literature in the area states that mobile phone technology has overcome several barriers in communication, as it is perceived to be affordable and flexible to the needs of the users. Research in other areas, views the influence of mobile technology as having promoted the informal culture in developing countries, and also gives a platform for users who are resistant to using formal Information Technology systems as a familiar platform in which to communicate (Hyde-Clarke, 2013).

The usage of these mobile technology applications presents a lack of knowledge in the existing literature for Malaysian manufacturing companies.

In conclusion, this section presents the main findings compared to the relevant literature in this area. E-procurement processes are not commonly practised in SMEs but are present in one of the cases in this study; a reflection of the nature of the

business of this case. Another main finding presents the prominent use of mobile communication applications; found to be most used by developing countries like Malaysia, to facilitate informal communications between buyers and suppliers, which is a method of communication preferred by the cases involved in this study. The relevant literature presents a gap in research in the use of mobile communication for Malaysian manufacturing.

The tools found in this study present differences to that of the relevant literature in the area, which speaks about E-procurement tools.

The following section of this chapter will discuss the current issues or problems experienced with the usage and presence of Information Technology tools in the cases involved in this study.

### 6.4.4 Problems and Issues Experienced With the Usage and Presence of Information Technology Tools in the Cases Involved in This Study

This section will discuss the issues or problems experienced by the cases involved in this study with the relevant literature.

#### 6.4.4.1 Training

Training is highlighted as the most common problem or issue experienced amongst the cases involved in this study. For the purpose of this research, training refers to knowledge of the users or employees of the information systems incorporated in each case.

Case E, as mentioned in section 6.4.3, states that an E-procurement tool is used, as the Information Technology tool to support their supplier selection process. To have

an effective and efficient process, on-going training is conducted by their “in-house” Information Technology team, to ensure that the users of the system are equipped with the necessary knowledge to operate the E- procurement system.

As mentioned earlier in section 7.4.3, Case E’s Information Technology tools differ from the other cases involved in this study. E-procurement tools are mostly mentioned in the relevant literature as the Information Technology tool used to support supplier selection. Relevant literature states that E-procurement tools include new technologies and changes to traditional procurement approaches, resulting in a need to train staff in E-procurement tools. Training should be given a high priority, to allow for the successful adaptation of the tool by the users (Vaidya et al., 2006). In relevant E-procurement research, training is highlighted as one of the main issues, as training affects indirect costs, and implementation of the practice (Angeles and Nath, 2007). These factors are similar to the issues experienced in Case E, but there is an understanding for the necessity for training. Unlike Case E, the other cases involved in this study do not incorporate E-procurement tools in their process. It has been highlighted that the other cases involved, prefer an informal method of communication. Employees are able to effectively transfer their knowledge and understanding by personal use of mobile communication tools.

As mentioned earlier in this section, one of the main issues surrounding training is the indirect cost to the firm; and by the use of mobile communication technologies such as WhatsApp, Kakao Talk, Line, and Skype, the cases in this study have eliminated training costs for their employees. It can be noted, that cost was not stated as an issue or problem in the findings, and it can be assumed that the use of mobile technologies can be the solution to this problem.

#### 6.4.4.2 Lack of System Integration

Relevant literature in this area highlights the importance of system integration, and also highlights the benefits of system integration as integrating and drawing data from a common database (Chapman and Kihn, 2009). Although the benefits are clear, a lack of system integration is highlighted as a problem or issue amongst the cases involved in this study. In fact, the only case in this study whose findings indicate system integration is Case E, whilst the other cases involved in this study, indicate a lack of system integration. Case E shows the usage of one system that carries out the functions of their supplier selection decision-making process as shown in the description of the cases. Whereas, the other cases in this study, use mobile communication technology tools, which are not integrated and do not share a common database and do not share the benefits of a unified system. Although the benefits of using mobile communications are shown to be cost-effective and flexible, the cases in the study do not benefit from system integration.

In another point discussed under this section, is that some cases mentioned a lack of integration within their departments, although in some cases various departments consider the supplier selection process. For instance, Case D and F, both state that they experience a lack of system integration. The relevant literature mentions that Information Technology is separate and meant to be used by such functions as procurement, production and sales; similar to the cases involved in this study. However, lack of integration makes it difficult and near impossible to connect as a functional system.

#### 6.4.4.3 Manual or No Presence of ICT

The integration of Information Technology tools presents various issues, including the cost of purchasing and implementation of Information Technology, and in some cases, business owners in Malaysian manufacturing do not see the benefits of the usage and presence of Information Technology tools. The findings present another issue of manual or no Information Technology presence as an issue experienced by some of the cases involved in this study.

It can be noted, that the findings indicate that all of the cases involved in this study have a presence of Information Technology, and also view the tool as being useful for communication, access to information and for the rapid retrieval of information. However, there are still some suppliers that do not have any Information Technology present in their firms. For the case of this research, assumptions cannot be made as to the reason for suppliers not being supported by Information Technology tools, but this does have an effect on the cases involved, such as: lack of accurate information, limitations to methods of communication and in some cases missed opportunity for a relevant supplier.

In conclusion, this section presents the highlighted issues of the findings for the problems and issues experienced by the cases involved in this study. The following section will discuss the effect of the Malaysian culture on the usage and presence of Information Technology.

#### 6.4.4.4 The Effect of the Malaysian Culture on the Usage and Presence of Information Technology in Malaysian Manufacturing

This section will discuss the findings for the emerging theme of this research: the effect of the Malaysian culture on the usage and presence of Information Technology tools.

The findings from the emerging theme present three (3) categories: financial, the Malaysian economy and a lack of technical ability. Exhibiting the effect of the Malaysian culture affects the implementation and usage of Information Technology.

The relevant literature in the area, does not discuss this issue specific to Malaysian manufacturing, but literature in supply chain states some of reasons that could possibly be related to Malaysian manufacturing, such as: a lack of managerial comfort of sharing information with other firms, an unwillingness to subordinate one firm's goals for the good of the supply chain, employee resistance to change, technological inadequacies, weak relationships among trading partners and not having the human and financial resources to invest in supply chain initiatives (Mentzer et al., 2000; Moberg et al., 2002).

The findings show similarities to the supply chain literature, as financial resources, and technological issues are highlighted. It should be noted that the Malaysian culture was not an element of investigation for this research topic, therefore data was not collected on the Malaysian cultural impact. However, this area of research presents a gap in the understanding of the Malaysian culture's impact on the usage and presence of Information Technology. It is understood by the researcher, that further investigating this gap, this can help manufacturers handle problems and issues and improve their supply chain.

### 6.4.5 Conclusion

This section presented and discussed the overall perspective of the usage and presence of Information Technology tools, the types of tools used by the cases involved in the study, the problems and issues experienced by the cases involved in

this study and the emerging theme - the effect of the Malaysian culture on the usage and presence on Information Technology tools.

It can be concluded that the objectives of investigating the usage and presence of Information Technology have been fulfilled. It has been found that the cases in this research view Information Technology to be beneficial and all of the cases use these tools to support their supplier selection decision-making process. Additionally, the findings present mobile communication tools, an element that is not present in the relevant literature, in Malaysian manufacturing. These tools are used for flexibility, and ease of communication with suppliers locally, regionally and internationally. This method of communication allows for informal communication, as preferred by the cases in this study. Additionally, the chapter presents the effect of the Malaysian culture as an emerging theme of the study. Although the literature does not mention these issues in the relevant Malaysian literature, other studies have shown there are similarities to these issues; however, there is a need for research in this area to uncover other cultural issues that could impact on this theme.

The following section will discuss and compare the usage and presence of Business Intelligence tools to support the supplier selection decision-making process in Malaysian manufacturing.

## 6.5 Business Intelligence Tools in Malaysian Manufacturing

### 6.5.1 Introduction

This section of the chapter will discuss findings of the usage and presence of Business Intelligence tools and to compare with relevant literature. This section presents the overall perspective of the usage and presence of Business Intelligence tools, the types of Business Intelligence tools used, and the impact of the Malaysian culture on the usage and presence of Business Intelligence tools. In providing a comparison against the relevant literature, this chapter is able to present and identify the current usage of Business Intelligence tools in the cases involved in this study

### 6.5.2 The Overall Perception of the Usage and Presence of Business Intelligence (BI) Tools to Support the Supplier Selection Decision-Making Process

The relevant literature states that BI tools are a technology-driven process used for analysing data and presenting actionable information (Schlesinger and Rahman, 2016). BI tools enable firms to make more informed decisions as information can be collected from external and internal sources, perform queries and create reports. BI tools are viewed as useful in supporting the supplier selection decision-making process, especially in manufacturing firms. Relevant literature compares the integration of BI into manufacturing firms to developed countries including France, Australia and the United States of America, and states that these countries have all embraced the benefits of BI. However, the literature fails to mention the integration of BI in developing countries such as Malaysia. The findings of this study present information regarding the presence and usage of Business Intelligence tools in

Malaysian manufacturing. In this study, the cases involved have all integrated BI tools to support their supplier selection decision-making process. Relevant research shows that SMEs, especially as represented in this study, are mostly prone to using different BI tools (based on the type of business) to support their firms.

The findings indicate that although there is a scarce amount of relevant literature in the presence and usage of BI tools in Malaysia, the perception of the usage and presence in Malaysian manufacturing firms exists and is viewed as beneficial.

The findings highlight that BI tools are used especially for creating reports, and for recording past purchases from suppliers. This information is deemed useful for future purchases.

In addition to this, the relevant literature states that most SMEs are unaware of Business Intelligence tools and their benefits. Moreover, the findings from this study show a difference within each case of in this study.

### 6.5.3 Type of Business Intelligence Tools (BI) Used by the Cases Involved in This Study

This section presents and discusses the findings for the types of Business Intelligence used by the cases in this study.

Relevant literature in BI and supply chain management, identifies SAP, PeopleSoft, and i2 as the most mentioned BI tools used in existing studies and research. Additionally, relevant studies have mostly mentioned the usage and presence of BI tools in developed countries such as: France, USA, and the UK. With regards to the usage of Western influenced tools used in Malaysian manufacturing, the tools used

are MS Excel and SQL Databases. The findings of this study view MS Excel to be user-friendly, reliable and not requiring staff-training. In most cases, MS Excel is also used as the main database for their approved supplier list. The findings also indicate that although other BI tools are used, MS Excel is still being used as a form of backup, and information is also simultaneously updated to ensure the database is up to date. MS Excel is considered by the cases by data input and post processing report generation properties, similar to the relevant literature (Cope et al., 2007).

The findings also present new BI tools not represented in existing literature, including: Sidelines, Epicor, MAP and Autocount. Malaysian software designers create all these BI tools and these programs meet the needs of Malaysian manufacturers. Case F, states that previous to the use of MAP, SAP was used, but the decision was made to change to a Malaysian software, as this software understood the needs and requirements of the Malaysian manufacturer. The program is flexible, and can be altered to the likeness of each firm. Furthermore, the interface looks like MS Excel, which enables the user or employees to use the system.

Case C also decided upon Malaysian software for similar reasons to Case F. Previously, Case C was using Oracle, but the BI tool was not flexible and accommodating to their needs.

The findings indicate a disadvantage to BI tools, as stated in the relevant literature, where the users do not like the solution, which can be seen from the findings of this study. Some of the cases involved in this study previously used American software, which is not suitable for their needs. Additionally, these BI tools presented a disadvantage of training, as this was required for using these BI tools. Whereas, the

BI tools uncovered in this study, eliminated these issues by using Malaysian made software.

### 6.5.4 Issues and Problems Existing with the Usage and Presence of BI Tools

This section will discuss and compare the issues and problems with the usage and presence of Business Intelligence tools, experienced by the cases involved in this study.

Relevant literature explains the benefits of adopting BI tools to their business, and all of the cases in this study have integrated these tools, but unlike the relevant literature, the cases involved in this study have used Malaysian designed software, as it is designed for Malaysian manufacturers. The relevant literature also identifies that there is no single tool well suited for one organisation, but the tools referred to are: Oracle, SAP, PeopleSoft and i2.

The relevant literature also describes the disadvantages, problems and issues with BI tools. The issues include: cost, complexity, limited use, and time-consuming implementation (Ndubisi et al., 2007). However, the disadvantages or issues deriving from the findings of this study, imply that technological concerns and incorrect information is the basis of their issues.

The cases in this study mention other suppliers they are in business with. In Malaysia, manufacturers have expressed a problem with the cost of implementing Business Intelligence tools as an issue, but were not mentioned directly by the cases involved in this study. Technological concerns, can be related to complexity and implementation time as reflected in the relevant literature. The cases in this study describe issues with

Western systems, compared to Malaysian made software as the data integration process from MS Excel to these BI tools is a long process, and in many cases, there are data accuracy errors. Another exercise, which uses the resources of the firms, would then need to ensure the transferred information is accurate.

The cases involved in this study, also mention a desire for their departments to be integrated, which is a function that is allowed by the Malaysian manufacturers, whereas Western software limited this process.

The relevant literature states that in some cases the users may not like the solution. From this point, it is obvious from the findings that most of the cases involved in this study have used a solution that is flexible and adaptable to each company. It also can be said that each case prefers this software to the generic software.

### 6.5.5 The Effect of the Malaysian Culture on the Presence and Usage of Business Intelligence Tools

The findings of this study indicate that Malaysian manufacturing companies, especially SMEs as represented in this study, have integrated and seen the benefits of using BI tools in their firm. However, the cases in this study, prefer to use Malaysian software, versus Western developed software.

The findings state that most Malaysian companies prefer to use local software as it is not too complicated, unlike other Western software and it is designed for “our” manufacturing. The cases in the study, believes that their manufacturing process differs from other countries, as it is viewed as being more result-oriented. The cases who have implemented Malaysian designed software felt that their needs were being met. The cases also felt that their manufacturing process differs from Western

manufacturing processes, as it is described as being more process-oriented, whilst Malaysian manufacturing is result-oriented. This software can be changed to meet their needs and their interests and there is an integration of technical tools necessary to manufacturing in Malaysia.

One of the cases compares the Malaysian software to mobile smart phones, where applications can be added to one's phone, to individual preferences and needs. This is the desired approach for Malaysians for this software.

### 6.5.6 Conclusion

This chapter presents the overall perception of the usage and presence of Business Intelligence tools, the types of BI tools used, the problems and issues and the effect of the Malaysian culture.

This section highlights some of the main findings of this study; the presenting of Malaysian BI software tools that does not exist in relevant literature.

The following section will discuss the presence and usage of Artificial Intelligence tools in Malaysian manufacturing.

## 6.6 The Presence and Usage of Artificial Intelligence Tools in Malaysian Manufacturing

The purpose of this section is to discuss and compare relevant literature with the findings for the usage and presence of Artificial Intelligence tools with the cases involved in this study.

The current state of Artificial Intelligence literature in this field, places this tool one that promises an improved decision-making process (Efthymiou et al., 2016). AI tools have been used in some research studies to address supplier selection decision-making problems, as it is viewed to be the correct tool for multi criteria decision-making problems. However, current studies in this area, use the AI function in mostly developed countries and there is a gap for the usage and presence of Artificial Intelligence tools in developing countries, like Malaysia.

This section will discuss the findings to the types of AI tools used in Malaysian manufacturing and the effect of the Malaysian culture on the presence and usage of AI tools.

### 6.6.1 Types of Artificial Intelligence Tools Used by the Cases Involved in This Study

The findings of this study indicate that there is no usage or presence of Artificial Intelligence tools used to support the supplier selection decision-making process, or any function of the Malaysian manufacturing. In most of the cases, it is reported that they are not even aware of what is an AI tool is or what its capabilities are. Relevant literature boasts the benefits of implementing AI tools, and also mentions the disadvantage of AI tools, as being complicated and complex. One of the cases, aware

of AI tools, does not believe it is necessary for Malaysian manufacturing, as it is not suited to the Malaysian culture, especially for decision-making. The decision-making process is seen to be an informal process, where face-to-face meetings occur and the implementation of AI tools would remove that element, and would not be suitable for Malaysian culture.

Relevant literature in the area also states one of the main disadvantages of the implementation of AI tools, as hacking; the ability to breakdown critical components relevant to Malaysian manufacturing.

It can be noted that, in studies, most research is conducted using quantitative approaches and secondary data. In most cases, these studies have proven unsuccessful. This research implies that Malaysian manufacturers already use AI tools, and do not consider the culture or their preferred way of business. This research indicates the difference to existing literature, by identifying that there is no usage and presence of AI tools used by the cases involved in this study, and this can represent other SME Malaysian manufacturers.

### 6.6.2 Conclusion

It can be stated that the cases involved in this study, do not use any AI tool to support their supplier selection decision-making process, or to support any other function of their business.

The findings also show, there is a lack of knowledge by the cases involved in the study towards AI tools, and that it is not suitable for Malaysian manufacturing.

## 6.7 Emerging themes of the research: Adoption, Resistance, Culture, Trust and SMEs

The purpose of this section is to discuss the topics of adoption, resistance, culture and trust, which have been identified as emergent themes as a result of the exploration of the data. These topics were not explicitly explored within the literature review nor did they form part of the data collection phase of the research, rather the research focused on the supplier selection decision making literature and the usage and presence of BI tools, ICT tools ad AI tools that supports the supplier selection decision making process.

### 6.7.1 Adoption

The findings show that all of the case companies studied have adopted information technology tools (ICT), and business intelligence (BI) tools to support their supplier selection decision making process. In chapter 6.2.4 and 6.3.3, the existing problems with the usage and presence of ICT and BI tools are highlighted within the cases. These problems include: inaccurate information, no IT support, technological concerns, lack of training, knowledge gap, lack of system integration, incorrect information, cost, and no room for flexibility. Some of the reasons for these problems and issues experienced by these cases can be understood in terms of existing technology adoption models. “The adoption approach describes and explains the adoption decision of users applying different individual and social decision making theories” (Manueli et al., 2007). The various models address the issues and problems experienced in this research project. Three widely used models include the Technology acceptance model (TAM), the theory of reasoned action (TRA) and the extension of TRA into a Theory of Planned Behavior (TPB), (Penderson and Nysveen,

2003). These models suggest that when a user is presented with a new technology, a number of factors influence their decision making regarding how and when they will use it.

### 6.7.2 Resistance

This section briefly discusses resistance to change as this theme also emerged from the exploration of the data for this research project.

Existing literature provides a number of frameworks that can be used to investigate the issue of resistance to change. For instance, the "status quo bias theory", which explains people's preference for maintaining their current situation or status (Samuelson and Zeckhauser, 1988). This theory relies on rational decision making, cognitive misperceptions, and psychological commitment. (Kim and Kankanhalli, 2009). Additionally, the Technology Acceptance Model (TAM) considers adopter's perceptions of the usefulness and ease of use of the technology, to predict an individual's intention of adoption (Davis et al., 1989). However, the topic of resistance to change was not explored within this research project.

### 6.7.3 Culture

The impact of national culture on the supplier selection decision making process, the usage and presence of information technology tools, business intelligence tools and artificial intelligence tools also emerged as an impactful and unexpected finding from this research. It became clear that Malaysian culture influenced the usage and presence of information technology on SME manufacturing. The findings of this study identify a relationship between Malaysian national culture and the adoption and usage of ICT, BI and AI tools.

Current literature argues that global organisations need to understand cultural differences if they are to be successful in deploying ICT (Meyers and Tan 2003). Notable research studies on the cultural aspects of the development, implementation, use and management of ICT, including Hofstede's (1996) model of national culture (Straub et al., 1997; Watson et al., 1994). As such, an exploration of the relationship between the Malaysian SME manufacturing culture and the usage and presence of ICT, BI and AI, is a topic worthy of future research.

### 6.7.4 Conclusion

This section briefly discusses the emerging themes from the data collection process: adoption, resistance, and culture to SMEs. These themes are relevant to the subject of the thesis, but was intentionally not explored or investigated by the researcher due to the constraints of the research project.

# Chapter 7: Conclusion

## 7.1 Introduction

The closing chapter summarizes the study's main finding and outlines its contribution. To begin, the research objective is revisited and the chosen research methodology is summarily explained. This is followed by a concise report of outcomes. Finally, the implications and limitations of this research are presented.

## 7.2 Research Objective

This study was heavily influenced by identifying and understanding the significance of selecting the most appropriate supplier in a supply chain. Supplier selection has received focus from academia and practitioner's due to its importance. Current literature in this area has provided solutions in the form of frameworks and new methods to support the supplier selection decision-making process. However, the area remains problematic, as supplier selection decision-making is viewed as a multi criteria problem. Typically, the current studies in this field are initiated by using secondary data on the supplier selection criteria, but were unable to come to a working solution for all supply chains, as the criteria for each industry or sector varies.

The current trend in supplier selection is the use of Information Technology tools, Business Intelligence tools and Artificial Intelligence tools to support the decision-making process. However, some studies did not consider the usage and presence of these tools in some industries and countries. Consequently, this research was driven to explore the usage and presence of these tools that support the supplier selection

decision-making process, in a country that is sparsely mentioned in the current literature. Malaysia was chosen for access to interviewee participants by the researcher, and for its presence in the manufacturing industry regionally and globally.

A comprehensive literature review has revealed that the supplier selection decision-making focuses on solving multiple supplier selection criteria problems, but does not address the problems and issues, or understand the current state of specific industries.

A literature search disclosed that studies dedicated to investigating the Information Technology tools, Business Intelligence tools and Artificial Intelligence tools used to support the supplier selection decision-making process are scarce in Malaysian manufacturing, and are therefore inconclusive.

Finally, cross case studies in the supplier selection decision-making process is especially rare, while previous research is mostly conducted under a quantitative research approach.

In an attempt address the aforementioned research gaps; this research project aims to answer the following research questions:

1. What is the supplier selection decision-making process in Malaysian manufacturing SMEs?
2. Which Information Technology tools are used to support the supplier selection decision-making process in Malaysian manufacturing SMEs?
3. Which Business Intelligence tools are used to support the supplier selection decision-making process in Malaysian manufacturing SMEs?
4. What Artificial Intelligence tools are used to support the supplier selection decision-making process in Malaysian manufacturing SMEs?

## 7.3 Summary of Research Approach

A qualitative case study approach was employed in this research project. At the outset, a comprehensive literature review was carried out to identify literature gaps. Once the research gaps became evident, it was necessary to design a data collection instrument. In the case of this study, the initial data collection instrument selected was a large case questionnaire. However, this data collection process failed and a new instrument was selected - an interview guide. The guide was constructed following a thorough analysis of the existent literature. In particular, the supplier selection decision-making questions were based on studies that focused on supplier selection, supplier evaluation, supplier selection criteria, and the efficiency and effectiveness of the supply chain. Additionally, literature on the usage of Business Intelligence tools, Information Technology tools and Artificial Intelligence tools to support the supplier selection decision-making process were all advised in order to construct interview questions.

This cross case study was conducted in Malaysia, and country selection was opportunistic, arising from family ties in the manufacturing industry in Malaysia. Using personal connections, six (6) interviews were conducted for this research project. The manufacturers in this study were selected through purposive and snowballing approaches. The decision to halt interviews was made when theoretical saturation was reached and there was enough data to make reasonable conclusions to answer the research questions.

The interview data was analysed using the thematic analysis method by Braun and Clarke (2006;2014), consisting of six phases. Initially the data is organised into categories and their properties define their themes.

## 7.4 Research Outcomes

The findings of this study suggest and highlight the supplier selection decision-making process in Malaysian manufacturers, and there is an emerging theme of the Malaysian cultural influence on their decision-making, and presents emerging Information Technology tools, and Business Intelligence tools used in the cases.

The sections below present a summary of the findings.

### 7.4.1 The Supplier Selection Decision-Making Process in Malaysian Manufacturing

#### 7.4.1.1 Supplier Selection Process

The findings for the supplier selection process for this research indicate that there is favourability to the “trial buy” supplier selection process. After identifying a need for a new supplier, most cases in this study prefer this process instead of adopting a more structured approach. The criteria used to affirm the decision to approve the new supplier is: delivery time, quality and pricing, and in some cases the supplier’s technical ability. The purpose of using this method is due to the location of the suppliers and the type of material or product. In most cases these materials or products are sourced regionally or internationally. However, this method results in problems and issues, including the quality of the material or product, the time the product takes to arrive, or incorrect specification of the product.

In addition, another reason evident in this study for using this method of supplier selection, is the “friend and family” association to the cases involved in this study. The findings show that Malaysian manufacturers are prone to selecting their suppliers on

the grounds of familiarity, which induces trust. Furthermore, this allows them to eliminate standardized procedures.

#### 7.4.4.2 Supplier Sourcing Methods

In the manufacturing industry, it is found to be important to have a multiple supplier environment, this allows for manufacturers to have different sources for the products, so a comparison of cost, quality and delivery time can be made. The findings of the study show, the impact of Internet has moved from traditional methods of sourcing or locating suppliers into methods that are influenced by Internet enabled methods (Alibaba.com). Mobile communication tools, mobile applications and global online marketplaces emerged as the key methods for locating and sourcing suppliers. The interviewees share that it is important for them to have access to multiple suppliers in order to negotiate cost, delivery time and quality. However, with this method, the problem or issue raised is that the quality of the product or service would not be able to be assessed until after its arrival. Additionally, in some cases, the information presented by the supplier is incorrect, but search engines are used to verify the validity of the supplier in question.

The findings also highlight the use of professional associations, trade shows and exhibitions as methods used to source or locate suppliers, as these suppliers are identified as being “recognised” or “valid”.

The findings present an inter-relationship with Malaysian manufacturers and the influence of Malaysian culture in using these tools to select or locate their suppliers. The cases involved in this study are prone to taking recommendations or reviews from their “friends or family” in selecting suppliers, even whilst using these tools. In cases

where these tools can be avoided, suppliers are sourced using the “family and friend” association.

#### 7.4.4.3 Protocols and Procedures

The study highlights the presence of a quality management procedure that is followed by some of the Malaysian manufacturers. This protocol defines quality standards to be followed, and also has a global presence. This process should impact the firm, and their suppliers, ensuring that the standards are met. However, the findings indicate that some selected suppliers related to the cases are not registered with this standard. Therefore, this can provide another reason for quality issues and inaccurate information from suppliers.

#### 7.4.4.4 Supplier Evaluation Process

The findings highlight various methods practiced when conducting the supplier evaluation process. In particular, the most common method used is to select suppliers for evaluation by the amount of revenue spent in a certain time frame. In other cases, suppliers who follow the quality management procedure as mentioned above, are not selected for evaluation as it is assumed that these suppliers are being monitored by the procedural organization, and these suppliers are overlooked. The results suggest, these shortcuts are due to a lack of resources, and in most cases, the suppliers were sourced through the family and friend association, and these suppliers are also overlooked.

#### 7.4.4.5 The Influence of the Malaysian Culture on Malaysian Manufacturing

The influence of the Malaysian culture was found to be an emerging theme, arising from the findings; this is realised to play an influential role in the supplier selection decision-making process. As shown earlier in this section, the Malaysian influence impacts on the supplier sourcing process, supplier evaluation process, and the supplier selection process. The findings highlight that firms are prone to seeking advice or reviews from people they can trust, to support their supplier selection decision-making process.

The study also informs that the impact of Malaysian culture influences the way business is conducted. It highlights an informal approach, over the procedural approach as in Western business environments.

### 7.4.2 Information Technology Usage and Presence

The findings reveal that there is a strong and beneficial viewpoint of the cases involved in this study, toward the usage and presence of Information Technology tools to support the supplier selection decision-making process, with access to information being the main reason. For this study, access to information relates to, access to supplier information and technical information.

#### 7.4.2.1 Information Technology Tools Used

The findings reveal the usage and presence of communication tools and mobile technology tools used to support the supplier selection decision-making process, by the use of the Internet, global marketplaces (Alibaba.com), mobile applications

(Whatsapp, Kao Talk, Line and Skype). These applications are used for accessibility and increased communication with the supplier.

#### 7.4.2.2 The Influence of the Malaysian Culture

The findings indicate an impacting role on the usage and presence of Information Technology tools in Malaysian manufacturing, and can be related to financial concerns and technological ability.

The cases explain that, for some Malaysian manufacturers, the usage and presence of Information Technology is viewed as a waste of money, and in these cases, these firms are manually run. Due to this, problems arise with communication with suppliers, as methods to communicate are limited and slower.

Also, technological concerns, are compared with the cases to other countries, whose technological presence are stronger than Malaysia. Due to this, Malaysia is viewed as a country that desires more effective Information Technology tools to allow them to compete with countries in the Western hemisphere.

### 7.4.3 Business Intelligence Tools

The findings reveal that the Business Intelligence tools used are mostly developed in Malaysia, and are preferred by manufacturing companies. In terms of the Business Intelligence tools, the cases imply that generic tools do not meet their manufacturing needs. It is found that there is a preference to have a tool that can be modified at any time, that can easily integrate departments, and reflects their business structure. By implementing Malaysian developed Business Intelligence tools, it reduces cost, and

the need for training, as these factors can also be modified for the manufacturer. Additionally, tools are designed to look like and operate like MS Excel, this increases usability factors.

### 7.4.4 Artificial Intelligence Tools

One of the areas of investigation involved in this study the usage and presence of Artificial Intelligence tools to support the Malaysian manufacturing process. The findings reveal, that the cases involved in the study, were not aware of what Artificial Intelligence tools are. Additionally, there is no need for this type of technology in manufacturing. This can also be due to the impact of the Malaysian culture, where Artificial Intelligence tools are presented as a method to select the most relevant supplier, using relevant selection criteria. However, the culture prefers face-to-face meetings with suppliers, and the selection criteria are not constant in Malaysian manufacturing as reflected in the findings.

## 7.5 Study Limitations

The following limitations to the study were identified:

### 7.5.1 Limitations of this study

- The sample of cases involved in this study focuses on one industry in Malaysian manufacturing, namely steel-based manufacturers. In order to gain a more holistic understanding of the supplier selection process, and the Information Technology and Business Intelligence tools used to support the supplier selection decision-making process, further research is necessary by integrating other manufacturing areas.

### 7.5.2 Limitations of the Research Approach

The following limitations to the research approach were identified:

- The initial data collection method for this study was to use a large-scale questionnaire method, to gather information from 250 Malaysian manufacturers on their supplier selection decision-making process, Business Intelligence usage and presence, Information Technology presence, and
  Artificial Intelligence presence, this would have allowed a more generalised overview of Malaysian manufacturing. However, due to a low response rate, and limited time, the data collection method was changed to semi-structured interviews.

- For each interview the interviewees were singular. The research would have benefitted from more than one interviewee, as the responses given from each interviewee could be bias. However, the interviewees were sufficiently knowledgeable.

### 7.5.3 Weaknesses of the research

The following weaknesses of the research were identified:

- As a lone researcher, conclusions drawn at the data analysis phase of the research is subjective, as compared to the objectivity that is demonstrated with more than one researcher.
- Missed coding opportunities - as the researcher could have been subjective in the data analysis phase of the research, other emerging themes, and coding could have been missed.

- One of the major weaknesses associated with qualitative research is that the process is time consuming. Due to time constraints, the researcher could have missed coding and analysis opportunities.

These weaknesses of this research project are reflected in the recommendations for future research (Chapter 7.7). Due to the subjective nature of qualitative research, and the confinement of the research area, other areas relating to this research could have been explored, for instance, Malaysian culture, ICT adoption models, and comparisons of Malaysian SMEs to other countries.

## 7.6 Implications for Academia and Industry

This section summarises the contributions and implications of this study to research and highlights implications for practice.

### 7.6.1 Implications for Academia

The research contributes to academia in several ways:

- There is a gap in the supplier selection literature in research based in Malaysia. Most existing literature is based on “developed” countries, for instance, United States of America, United Kingdom, and European countries. Malaysia is identified by the literature as a developing country in the South East Asian region and highlights a strong presence in the manufacturing industry (Boonsiritomachai et al., 2016).
- Current studies in the area of supplier selection, mostly use secondary data to conduct their studies (Hajidimitriou and Georgiou, 2002; Talliri and Baker, 2002; Ip et al., (2003); Babic and Plazibat, 1998); Talluri et al., (1999); Sha and Che, (1996). This research project builds on existing literature to make an empirical contribution, by adding rich data derived from in-depth interviews.
- Supplier selection methods are defined and classified in the research, and are defined to be process driven. Furthermore, pricing, quality, product and service is defined as the criteria used by these methods (Hadi and Mastor, 2005). The research provides empirical evidence that the supplier selection method varies in these cases, along with the supplier selection criteria.

- The study introduces the influence of the Malaysian culture on the supplier selection decision-making process for the first time, by identifying the importance of importance of “friend and family” associations. Relevant literature in supplier selection criterion excludes culture as an influential factor in the decision-making process (Ellram, 1996; Patil, 2014; De Boer et al., 1999). This research builds on the supplier selection decision-making literature by considering the family and friend associations in Malaysian manufacturing literature.
- Artificial Intelligence is perceived by the literature to be incorporated in the supplier selection decision-making process (Efthymiou et al., 2016; Jamil et al., 2013). The tool is also viewed as one that solves the supplier selection decision-making problem (Hadi and Mastor, 2005). The relevant literature highlights many Artificial Intelligence studies dedicated to the supplier selection decision-making process (Hajidimitriou and Georgiou, 2002; Talluri and Baker, 2002; Ip et al., 2003; Babic and Plazibat (1998); Sarkar and Mohapatra (2006); However, this study provides empirical evidence that there is no presence of Artificial Intelligence tools supporting the supplier selection decision-making process in Malaysian SME manufacturing.
- Finally, an important contribution of this study is in its methodology. Whilst existing studies focus on supplier selection criteria make a valuable contribution to the overall presence of supplier selection decision-making research, quantitative methods prevail in this research stream. There are calls to expand on studies that employ qualitative methods in order to overcome methodological challenges associated with quantitative research (Merriam, 2014). This research employs a qualitative methodology.

### 7.6.2 Implications for industry

The research contributes to industry in several ways:

- Business Intelligence software mentioned in the established literature is identified as needing to be developed in the United States of America and Europe (Hadi and Mastor, 2005). This research adds to the limited area of Business Intelligence tools by establishing that there are tools being developed in Malaysia for Malaysian SME manufacturers.
- Ong et al., (2011), points out that Business Intelligence tools have become an important aspect of a firm's decision-making tools, and is most beneficial for manufacturing firms. Relevant literature in Business Intelligence tools seldom mention the adoption of these tools in Malaysia (Ong et al., 2011). Countries such as France, Australia and the United States of America are the most mentioned countries in Business Intelligence studies. This research adds empirical evidence to the Business Intelligence tools literature by identifying the tools used in Malaysian manufacturing.
- The implementation and use of technology is an integral part of supporting the supplier selection decision-making process (Yeh and Lee, 2014). Within the established literature relative to Malaysian manufacturing, E-procurement literature is mostly presented as the Information Technology tool used to support supplier selection (Ndubisi et al., 2004; Mahmut 2006). This research adds to the presence and usage of Information Technology tools by identifying the use of mobile communication tools, and global marketplaces to support the supplier selection decision-making process.

- Studies on supplier sourcing are limited to magazines, exhibitions, trade associates, and international trade fairs (Keivan and Shahgolian, 2012). This study introduces empirical evidence of methods used for supplier sourcing, including online global marketplaces and mobile applications.

## 7.7 Recommendations for future research

This section will state the recommendations for future research opportunities.

- A comparison of the Western or developed countries and non-western countries or developing countries, in the context of the supplier selection decision-making process, to highlight differences in the supplier selection decision-making process.
- The influence of the Malaysian culture on the supplier selection decision-making process should be further explored. As highlighted in the findings of this study, the Malaysian cultural influence plays an impacting role on decision-making, due to trust. Future research should explore the trust factor in supplier selection decision-making.
- Future research can employ a different data collection instrument, for instance a large scale questionnaire to investigate the supplier selection decision-making process in other manufacturing industries, for complete representation of the sector.
- It would be beneficial to duplicate this study in different developing countries to compare the findings.
- For practitioners in the respective fields, BI tools can be developed to reflect the specific needs of different industries. Data collection can be conducted to understand managerial needs to be integrated into the BI tools.
- A study into the area of BI tools in other developing countries to compare if the usage and presence of Business Intelligence tools are the same or different.

- The findings of the research show there are no AI present in the cases involved in this study. Using a different data collection instrument and a larger sample, would be beneficial to practitioners to understand the usage and presence, and to ascertain what the issues or problems are, in order to provide solutions.

## 7.8 Conclusion

This final chapter of the thesis concludes by presenting a summary of this research project including: the research objectives, research approach, research findings, limitations of the study, implications for academia and industry and recommendations for future research.

# Appendices

## Appendix A – Thematic codebook

### Phase 2 – Creating initial codes (Open Coding)

| Phase 2- Generating Initial Codes | Sources | References |
|---|---|---|
| Type of Business | 5 | 17 |
| Project Management | 1 | 1 |
| Steel Manufacturer | 0 | 0 |
| Rubber Products Manufacturing | 0 | 0 |
| Countries the company trades with. | 6 | 7 |
| ISO Certified Company | 2 | 5 |
| Supplier Agreement | 1 | 1 |
| Not ISO Certified | 1 | 1 |
| Training | 3 | 6 |
| Cost | 1 | 2 |
| Knowledge gap | 1 | 2 |
| Inaccurate Information | 4 | 8 |
| Culture | 1 | 1 |
| Time | 1 | 1 |
| Data Accuracy | 2 | 6 |
| No room for flexibility | 1 | 1 |
| Quality | 1 | 4 |
| Communication | 1 | 1 |
| Supplier sourcing problems. | 3 | 4 |
| No Difficulty | 1 | 1 |
| No IT support | 1 | 3 |
| Technical Ability | 1 | 1 |
| Staffing | 1 | 1 |
| Location | 1 | 4 |
| Volume of Product | 1 | 2 |
| Amount of Stock | 1 | 2 |
| Cost | 2 | 3 |
| Financial | 2 | 4 |
| Friend or Family Association | 3 | 4 |
| Malaysian Economy | 1 | 2 |
| Incorrect Information | 1 | 1 |
| Technological concerns | 2 | 2 |
| Supplier Selection Process | 6 | 67 |
| Unstructured process | 2 | 2 |

| | | |
|---|---|---|
| Internet | 6 | 18 |
| Email Advertisement | 2 | 2 |
| Reputation | 1 | 1 |
| Telephone Calls | 1 | 1 |
| News Magazines | 1 | 2 |
| Word of Mouth | 5 | 9 |
| Advertisements | 1 | 1 |
| Webpage | 1 | 1 |
| Professional Associations | 2 | 3 |
| Mobile Applications | 2 | 6 |
| Exhibition | 2 | 3 |
| Yellow Pages | 2 | 3 |
| Green pages | 1 | 1 |
| Availability | 2 | 2 |
| Delivery Time | 4 | 11 |
| Reliability | 1 | 1 |
| Safety | 0 | 0 |
| Environment | 0 | 0 |
| Cost | 5 | 10 |
| Environmental | 0 | 0 |
| Quality | 6 | 16 |
| Service | 3 | 6 |
| Technological attributes | 3 | 4 |
| Financial Stability. | 2 | 3 |
| Site Visit | 4 | 6 |
| ISO Certified | 0 | 0 |
| Procurement Team | 0 | 0 |
| Purchasing Team | 2 | 2 |
| Sourcing Room | 1 | 2 |
| Managing Director | 1 | 1 |
| Time that is taken to perform a supplier evaluation. | 3 | 3 |
| How are supplier’s chosen | 3 | 11 |
| How are suppliers evaluated. | 3 | 12 |
| How are suppliers audited. | 2 | 5 |
| Supplier Monitoring | 0 | 0 |
| Types of Information technology tools used. | 6 | 48 |
| Lack of system integration | 1 | 1 |
| Manual System NO ICT Presence | 1 | 1 |
| Supplier Agreements | 2 | 2 |
| Email address | 2 | 2 |
| Times of usage of the supplier | 1 | 1 |
| Website | 1 | 1 |
| ISO Registered | 1 | 1 |
| Company Name | 4 | 4 |

| | | |
|---|---|---|
| Company Address | 4 | 4 |
| Type of Business | 3 | 3 |
| Financial Information | 1 | 1 |
| Type of Material they can supply | 3 | 4 |
| Price of Materials | 1 | 1 |
| Contact person | 0 | 0 |
| Amount of Employees | 2 | 2 |

## Phase 3 – Searching for Themes (Developing Categories)

| Phase 3 - Searching for Themes (Developing Categories | Sources | References |
|---|---|---|
| Company Background | 6 | 32 |
| Type of Business | 5 | 18 |
| Countries the company trades with. | 6 | 11 |
| Supplier Selection Criteria Processes. | 6 | 74 |
| Supplier Selection Process | 6 | 67 |
| Unstructured process | 2 | 2 |
| How are suppliers sourced or located. | 10 | 65 |
| Internet | 6 | 18 |
| Email Advertisement | 2 | 2 |
| Reputation | 1 | 1 |
| Telephone Calls | 1 | 1 |
| News Magazines | 1 | 2 |
| Word of Mouth | 5 | 9 |
| Advertisements | 1 | 1 |
| Webpage | 1 | 1 |
| Professional Associations | 2 | 3 |
| Mobile Applications | 2 | 6 |
| Exhibition | 2 | 3 |
| Yellow Pages | 2 | 3 |
| Green pages | 1 | 1 |
| Supplier selection criteria. | 6 | 78 |
| Availability | 2 | 2 |
| Delivery Time | 4 | 11 |
| Reliability | 1 | 1 |
| Safety | 0 | 0 |
| Environment | 0 | 0 |
| Cost | 5 | 10 |
| Environmental | 0 | 0 |
| Quality | 6 | 16 |

| | | |
|---|---|---|
| Service | 3 | 6 |
| Technological attributes | 3 | 4 |
| Financial Stability. | 2 | 3 |
| Site Visit | 4 | 6 |
| ISO Certified | 0 | 0 |
| Company size | 3 | 4 |
| Number of Employees | 2 | 2 |
| Who is responsible for the decision making process | 5 | 13 |
| Procurement Team | 0 | 0 |
| Purhasing Team | 2 | 2 |
| Sourcing Room | 1 | 2 |
| Director | 1 | 1 |
| Supplier Evaluation or Audit | 6 | 44 |
| Time that is taken to perform a supplier evaluation. | 3 | 3 |
| How are suppliers chosen | 3 | 11 |
| How are suppliers evaluated. | 3 | 12 |
| How are suppliers audited. | 2 | 5 |
| Supplier Monitoring | 0 | 0 |
| Information Technology. | 6 | 61 |
| Types of Information technology tools used. | 6 | 48 |
| Lack of system integration | 1 | 1 |
| Manual System NO ICT Presence | 1 | 1 |
| Information stored on suppliers | 6 | 40 |
| Supplier Agreements | 2 | 2 |
| Email address | 2 | 2 |
| Times of usage of the supplier | 1 | 1 |
| Website | 1 | 1 |
| ISO Registered | 1 | 1 |
| Company Name | 4 | 4 |
| Company Address | 4 | 4 |
| Type of Business | 3 | 3 |
| Financial Information | 1 | 1 |
| Type of Material they can supply | 3 | 4 |
| Price of Materials | 1 | 1 |
| Contact person | 0 | 0 |
| France | | 1 |
| Germany | 1 | 1 |
| United States of America | 1 | 1 |
| Malaysia | 1 | 1 |
| China | 0 | 0 |
| Protocols and Procedures | 3 | 11 |
| ISO Certified Company | 2 | 6 |
| Supplier Agreement | 1 | 1 |
| Problems or issues experienced with existing systems | 3 | 11 |

| | | |
|---|---|---|
| Training | 3 | 6 |
| Cost | 1 | 2 |
| Knowledge gap | 1 | 2 |
| Artificial Intelligence | 2 | 7 |
| SME vs Macro organisations. | 1 | 1 |
| Problems with supplier selection process or suppliers. | 5 | 44 |
| Inaccurate Information | 4 | 8 |
| Culture | 1 | 1 |
| Time | 1 | 1 |
| Data Accuracy | 2 | 6 |
| No room for flexibility | 1 | 1 |
| Quality | 1 | 4 |
| Communication | 1 | 1 |
| Supplier sourcing problems. | 3 | 4 |
| No Difficulty | 1 | 1 |
| No IT support | 1 | 3 |
| Technical Ability | 1 | 1 |
| Staffing | 1 | 1 |
| Location | 1 | 4 |
| Volume of Product | 1 | 2 |
| Amount of Stock | 1 | 2 |
| Cost | 2 | 3 |
| Malaysian Culture | 6 | 29 |
| Financial | 2 | 4 |
| Friend or Family Association | 3 | 4 |
| Malaysian Economy | 1 | 2 |
| Incorrect Information | 1 | 1 |
| Technological concerns | 2 | 2 |

## Phase 4 – Reviewing Themes (Drilling Down)

| Reviewing Themes (drilling down) | Sources | References |
|---|---|---|
| Company Background | 6 | 36 |
| Supplier Selection Criteria Processes. | 6 | 74 |
| How are suppliers sourced or located? | 10 | 65 |
| Supplier selection criteria. | 6 | 78 |
| Company size | 3 | 4 |
| Who is responsible for the decision making process | 5 | 13 |
| Supplier Evaluation or Audit | 6 | 44 |
| Information Technology. | 6 | 61 |
| Information stored on suppliers | 6 | 40 |

| | | |
|---|---|---|
| Protocols and Procedures | 3 | 11 |
| Problems or issues experienced with existing systems | 3 | 11 |
| Artificial Intelligence | 2 | 7 |
| SME vs Macro organisations. | 1 | 1 |
| Problems with supplier selection process or suppliers. | 5 | 44 |
| Malaysian Culture | 6 | 29 |

### Phase 5- Developing Thematic Framework (Data Reduction)

| **Phase 5- Developing Thematic Framework** | **Sources** | **References** |
|---|---|---|
| Artificial Intelligence Presence in Malaysian Manufacturing Companies | 2 | |
| Business Intelligence Presence in Malaysian Manufacturing Companies | 6 | 70 |
| Information Technology Presence in Malaysian Manufacturing Companies | 6 | 157 |
| Supplier Selection | 10 | 1356 |

# Appendix B – Interview Scripts

## Case A

Company background

FR: Can you tell me a little about your company?

FR: Can you tell me what countries does your company do business with?

Interviewee: Japan, Korea, China, Ukraine.

Supplier selection process

FR: So in as much detail as possible, can you explain to me your supplier selection process?

Interviewee: How I look for them?

In most cases they look for me. We don't look for them. There is a lot we do in the market. And it comes to us and asking us for inquiry, asking us to give them opportunity to quote to us. 15 seconds. So most of the time we are not in the market looking for suppliers.

They literally come to us. Because in the steel industry, there are only a handful of players, I mean I am talking of the quite big size company that is ever growing Russian market. So there is like five or six of this one.

FR: Okay, especially as you are dealing in trading, because from what I saw, its manufacturing and trading that the company does. But this works for only any trading where you operate or is it the same as manufacturing? Do you know?

Interviewee: Manufacturing, okay? A lot of auto traders would look for that.

See, manufacturing, I am not sure of manufacturing much, I but know that they sometimes we receive news from viewers of highest telegram I have ever received. Whether you are interested in buying at this price, these terms and conditions. So what conditions they'll be, I'll provide you.

But for trading. Yeah.

Its not your concern if any supplier is that. If you are comfortable with and this is a first time supplier.

FR:  How do you know if you will be comfortable with this particular supplier?

Interviewee: After meeting, we talk to them, who are they, because these are traders, these are middlemen, these are brokers, especially.

So the mills are backing them.

Mills mean the manufacturers in China or in Europe or in Korea, Japan.

So, these people will come to us. We will rather know who is the mill that order. So, it does so much again, is who are they representing.

So if they represent a reputable mill, then we have to know. So that this party, or rather we can accept this particular mill that this party is representing. How well will he or she perform, that we have to evaluate.

Okay.

FR: This particular party. That's how the industry works.

And do you have particular evaluation process?

Interviewee: Not really. Plus we are more into trial order sometimes.

FR: Okay, trial order.

Interviewee: We pay a order, okay sure, we'll give 100 pack, 200 pack. Just try it. You have to lower your delivery and the quality. And if that feels safe.

FR: So those are your two main supplier selection, quality and pricing.

Interviewee: Quality and pricing. Yeah. And delivery.

FR: So its three?

Interviewee: It's three. So if they can perform there, then we'll give our trial order. So we'll do that a few times. Before we are very comfortable with them.

FR- Do you know how many steel manufacturers or in traders, if you want to put it, is operating in Malaysia?

Interviewee: As I say you have a pool of 5. You are talking about manufacturer? Now, they are main time manufacturers. They are steel products. What are the products you are talking about?

FR: When you were just talking about mills and you are updating and trading and you are mentioning just a handful. Do you know how many in, roughly?

Interviewee: Malaysia, there is a 5 options and 2 Southern steel and M steel, mast steel.

These are the 5 main.

FR: So in your case, for, exactly as you said that you don't need to seek them, you already know all. You are. Okay.

FR: You already mentioned to me what is the supplier selection criteria, which is delivery,

Quality

Quality.

Price.

Price. Okay. Is there any instances where the supplier selection criteria would vary? If there are any cases where you would look for anything else?

Interviewee: We only look into other suppliers, if the present suppliers, that supplies to me fails in their delivery. Or we loose confidence in them. Then we start looking for another one. Which we know, there are 3 or 4 in market.

That can supply the same material.

Okay, It's just that which mill they'll go for. They'll go for the Spanish mill, or the Korean mill or the China mill

FR: Are their any other supplier selection criteria that you look for when selecting a supplier?

Interviewee:- Technical ability.

Because certain mills, okay. Steel products, there's many kind of steel. Okay, Yeah. There are cases when they want a very special steel product. As if, like for example, we call it boiler plate. You know, you boil a boiler plate, which is hot. So they mix certain types of steel. You can get a normal boiler plate, but you need a higher credit boiler plate which consists of maize, consists of cube steel, and no nitrogen, things like that. To certain non-dynamical, very specific to specific period in the market. That can produce this type of material.

That type of material.

FR: How often, do you know how often that really happens?

Interviewee: Oh, it does happen. It does happen.

FR: Often?

Interviewee:- Yeah, it does happen. Normally this type of selection, we normally go for Japanese mill.

Only Japanese mill.

FR: So you know exactly who you are going to. And of these things, you have to experience.

Interviewee: Not experience, but we know that they can, they can produce such material.

All of them working for most of it now they are coming out with single product, you want or whatever it is. And then they will give us some product knowledge and then, okay, then we will clearly, just in case you come across it, we can go back to them and to get more information. Because steel is such a, how do I say, you need to update yourself out there and there are so many colours, specs and flagship. There is so many color shipment. Volume bigger. There is so many companies, there is no one specific plate that can meet all the requirements. See, for oil and gas industry, they are very specific.

Specific, right.

Specific. You cannot go to, say, channel me up and buy. You'll not be able to use. Normally there are good European mill or Japanese mill. Only certain Korean mill, the real big, big Korean mills can only produce this. So not ordinary can produce specific.

FR: And you find out this information by them E-mailing you because the steel industry is so small.

Interviewee: Yes. And sometime when my boss go to Japan mill, visit certain mill that are very good. And like them, what are the latest corporate in the market. So do we come across in their Proof of funds. (POF)

You just make sure you put them on your supplier list but you know exactly who you can go to.

FR: My next question was, how are suppliers evaluated. But you already mentioned that to me. By a trial buy.

Interviewee: Yeah, a trial buy, trial buy.

FR:  Who is responsible for the decision making process?

Interviewee: My MD.

FR: Are there any other contributions from any other people or departments that will give him this information to make his decision? Any others to the MD to make the decision to buy?

Interviewee: Decision to buy. Yes.

Decision to buy will come from inquiries. If you have any inquiries. We don't buy and stock. Certain products, the higher we buy, we collect their order. We're in there for specific requirement. Phase buyer, specific customer. So we don't just buy.

The normal products we can buy and stock but for specific ones, so meant for specific projects, then we go for best specifically. So an inquiry comes in, we offer them.

We go to the mill and say this is what we want. When can you deliver? How fast can you deliver?

FR: How long does that usually take when you are buying the specific type of material?

Interviewee:- 3 to 6 months.

FR: All right. So in your opinion, are there any issues or problems that comes to mind with the selection process?

Interviewee: Issues and problems?

FR: Yeah. That comes to mind with your selection, well, your supplier selection process?

In your case, you already know who are your suppliers, but are there any problems that you encounter?

Interviewee: Oh. Problems are always there. Quality.

FR: Always quality?

Interviewee: Of course quality. Quality issues, because quality comes from 2 errors.

One, it could be due to poor handling.

In the hot mills, they really handle materials very rough. So they have made the damage to material, scratches and dents.

Number two, it could be due to rusting. See if I buy from China during winter or Japan during winter, it's bound to rust, because you are talking about cold country to the hot country.

So rust is second. Oxidization.

Yeah. So, basically these are the main issue and the other one is definitely. But all these are coverable issues definitely and another one is seawater contamination.

FR: So moving on to the information technology part of the interview.

What are your thoughts on having information technology and business intelligence tools and artificial intelligence support for supplier selection?

Interviewee: This is something we are looking into. I think, it's something good to have but is not legit to have here in the Malaysian economy.

It's not the usual. As I mentioned earlier, for the steel business we are aware of the suppliers, we know the players in the market.

We do keep track of the supplier information through Excel, Oracle and SAP. This is done for simplicity so that we can retrieve information faster, but we do not have specific tools or software just to do this.

FR: As there is no presence of Business Inteligence or Artificial Intelligence tools currently, would you think it would help if you had support from information technology or artificial intelligence? Yeah?

Interviewee: Yeah.

FR: In what way do you think?

Interviewee: Basically which information, who are the ones that can supply certain products because we may not know.

Because certain companies, you can see, assess it, steel material, somebody today comes to me and say I want to look for this material. I say what? Never heard of. Where to look for?

FR: And if this is the case, how do you get information about this supplier?

Interviewee: Start making for calls.

FR: So do you use the internet at all?

Interviewee: Sometime we do.

FR: Do you use Google and you find the information you need?

Interviewee: We go to Google, or Alibaba and retrieve information from there.

Thee purchasing team also relies on mobile apps so that they can source information about the requirements for different products.

But they only go for information as in market information as to how the industry is moving, how steel industry doing, you know. Whether it's going up, it's going down, or maybe stocks.

Stocks meaning, looking at the commodities. You see if the nickel price is going up, or copper price is going up, they'll come to, oh the price of stainless steel might go up or come down, you know. It's just an indication. So by looking on those apps, an example of one of the apps is called EC3. They are very good.

The ECCS, EC3, the systems,

FR: EC3, okay. Good. All right. I'll have a look into that.

Interviewee: Just have a look because this are where we all get information.

FR: Is this the only mobile app or source that you use to gather information?

Interviewee: So sometimes, you get a request from someone and they ask you for a particular thing. You don't know what it is, you go on this app we use the application's functions for the requirements for this person.

Yeah we go on this app, all the calculations and things like that.

I am not on this phone many, many years.

FR: So basically, you, the only thing that you guys use is Excel, to store your suppliers or any, or anything IT related.

Interviewee: No we also have our own software. The company has just changed to a software called Epicor.

That's an American ERP System.

FR: Does it meet all of your needs or are there limitations?

Interviewee: No it does not meet all of the needs there are limitations because there is a knowledge gap, knowledge gap in the sense that it is something new.

FR: Ah. Is it knowledge gap where the people that are using it?

Interviewee: Knowledge gap with people using it.

FR: But it would be good for me to have a look into it to put here in the beginning. Yeah. It'll be good to integrate it. So how are these suppliers recorded? Are there any, do you know how are they recorded? Is there any criteria's or, like name, address, what information do you use to record it?

What information we use to record it?

Interviewee: Definitely name, address, fax no., telephone no, E-mails and the person in charge. That's our best standard information.

What about types of material requested, times of, times of usage The amount of times that you used them? Types of products?

In fact our usage, we normally, I don't think they record it up but they would know the number of purchase order we give to discuss the price. So through the number of purchase orders the purchasing department will know.

FR: Yeah, so in a way you do record that.

Yeah, yeah we do that.

Purchase order. Do you know any other,

FR: Do you know of any other things that you use?

Products they supply?

Interviewee: Types of product, yeah. Okay.

FR: Can you tell me if there is an auditing process for this excel spreadsheet?

Interviewee: No. No auditing process.

FR: So how do you know if the information is correct and up to date?

Interviewee: Yeah, I know. There is no auditing done. So far, I have not encountered any problems in terms of information not being up to date. If the person leaves or a person not there, then we will know, as our business is conducted through face to face meetings and we will also be aware by word of mouth as this industry is so small.

We move from. And then we start calling, hey I heard you left. Oh yes, for that, sorry, you know. So it spreads out very fast. It moves very fast. Impossibly fast.

Small. Like, like I say this Thursday we're gonna have a dinner. We called a manufacturer for dinner. That's all we see around, we move around, we see the same old faces and start walking.

And then you getting to know,

Someone is at the hold up desampling a description. So we go now, we record now. That's how it works. You have to be in the market all the time. That's very important. So that's why we move our sales people into the market, get the information.

Sales, field people.

Like a one very particular sales manager who can get any information just like that. It's the intelligence of.

Yes. His intelligence. It's human intelligence.

Yeah. It's human intelligence. He just gets the information. He knows what's going out in. who has gone here, who has gone there, who is married, who was married, that. Everything.

FR: I just asked you if there were any problems that you experienced with your system and you're just telling me, just a knowledge gap with like training.

Interviewee: Yeah, training. Yeah.

FR: Is there any training that you provide to your staff?

Interviewee: It's an on-going training to the staff. But because it's a new system we just brought in about last year only and then we went live only just months ago.

So there's still a lot of knowledge gaps and a lots of parts here and there and a lot of things not so much about this because we changed a new system that can fit into the whole organisation. We are doing this department by department, as currently there is no integration with each department. so integration was important.

Important. So we do the integration now on.

We would say, okay, we need to improve this and improve that. So, so things will start coming into this. But not at this moment.

FR: This is actually my next question. Are there any problems that you are experiencing? But besides the knowledge gap, is there any information problems that you are presently experiencing?

Interviewee: Information problem. What kind of information problem? Can you elaborate that?

FR: For instance the types of information that you enter, is there any problems with that? Has it caused you any problem?

Interviewee: Yeah, yeah. It does, it does. Sometimes, it doesn't seem to capture the information that is to come out. As I say I don't know where are the system parts or system issues or we are not sure. Because as I say, it's still a new system and everyday we encounter, sometimes, at certain hours, its closed off. You know. So, so we are not sure.

I think it does for lunch, it goes for a sleep and comes back. (haha)

So we are still tackling this issue with the vendor (Epicor), they are looking into to why this is happening. So we do have issues.

FR: Could you tell me, the type of information that it generates, what do you look for?

As in the reason for selecting this particular program, example: generates receipts? Does it generate purchase orders? What are the types of information that it generates for you?

Interviewee: It's a very integrated system where we can have a linkage between company A and company B and company C., we wanted to link all of our companies together.

I want to be sure that if company A does something with company B, it can be automated or A does something with C, it can be automated. So automation is one of the reasons for changing to this system and to have a more seamless process.

So we are looking for stock information and I want to know whether company B or C has stocks of a particular item. This system can also allow me to have access to this information.

Very basic information that we need to know across the whole companies.

So this system was implemented to integrate everything. It has not been implemented in manufacturing, but it will be soon

If we, I would think about 3 years down the road, 4 years, we have to get our system stabilized.

FR: This system would make everything easy and you'll have all information which can be easily accessed.

Interviewee:- All information. Assuming tomorrow I will be sent out as just a representative of this in America, I can still use this system.

They can assess all from America and see whatever is good.

As well as everything down the road like human resources, and all other departments, currently it is the Purchasing, stocks and accounts.

So its just purely for supplier and sales.

FR: Okay. All right. So now we have finished that part of ICT so I am looking at your perspective. What are the current issues or problems that exist in the decision making process in manufacturing in Malaysia?

Interviewee: Let me digest it.

FR: So the question is, in your perspective, what are the current issues, Obstacle or problems, that exist in the decision making process for supplier selection in Malaysia.

Interviewee: What are the issues and problems?

FR: The reason for this question is I am trying to, how I've noticed that a lot of decisions are made in supplier selection, are made as you write for these by sitting on a table with each other, you meet people. You have your sales team and it is not supported by information technology or you said that human intelligence, do you find any flaws, or problems, or issues with that in Malaysia? I am not looking at any other country.

Interviewee: That's difficult question to answer. It's that it, definitely there'll be flaws, you'll see that. So the information why, because if we look at human intelligence, get information, you may feel this particular practice is, hey, you buy from Farlon, she is good and she can provide you some, oh ok don't wait for her. Their worries starts, you know, with things like that. You don't have, actually the hope is the test. What were your companies that, you're almost against. This was, you know, so we have to be smart enough to see who is telling true.

Maybe you don't want me to buy from your suppliers. You may have your own supplier. Where maybe she has many suppliers, So we do it. We show where we buy and all. We find that WhatsApp, that is favorite this customer, had not feeling weightless. And we worry why.

So the information is not precise.

If you go into, so called software, where you are trying to collect all this information, how accurate it is, I'll not know because you are to put into the system.

But Malaysia, I can answer you because what, if you can use a search engine, you can easily tell who gives more.

So you think that by using artificial intelligence or business intelligence tools, it will definitely help.

Helps, to give back to.

FR: When my framework is completed, Would you be interested in testing phase.

Interviewee: Yes, it would be very interesting to see how the framework selects suppliers, so we can actually have why this information is, but looking at more suppliers, at the time of selection, you know. And then we can go into and try out, see who is the best.

Everyday I receive E-mails from everybody all over China and I don't know who they are so I am not interested to even look at them because all the time, because of the method in which it comes.

FR: Is there a particular size of company that you deal with?

Does it only have to be only large companies?

Interviewee: It has to be very large or some part of the government. We would not go for private. Private mills.

FR: Is there any reasons for that?

Interviewee: In the case of private mills, unless we visit a mill and see the mill, how it works we would not be interested. You see I've visited, a mill last year and there was no product.

FR: So is one of your selection criteria's is to conduct a site visit

Interviewee: Depends actually, it depends. First of all, as I said, most of the mills that we work with are already people we know and we know their background. If it is a new one, there is a possibility that we might go and see. There's a possibility.

FR: So in addition to the trial buying, in some cases you do visits.

Interviewee: May do visits.

FR: That makes sense actually. Do you think the problems that you just spoke about exist in any of the countries that you trade with?

Interviewee: In terms of what? In terms of quality?

FR: You spoke about the knowledge gap, of not being aware of all of the suppliers that you can select because you mentioned to me earlier about 5 or 6 that you continuously deal with. And you don't know if there are more suitable suppliers.

Interviewee: Yeah, there are more suppliers, definitely.

Of course, there are more, exactly, and there is a knowledge gap with information with who and who does what. And do you think that this exists as well in these other countries like Japan, Korea, and China.

No, it's basically China.

It's basically China.

FR: No, but you said the companies that you trade with,

FR:- Do you think, that they also experience the same problems that you experience? Or these countries have been looking at the supplier selection.

Interviewee: And looking at the scale of information technology with these countries are high in comparison to Malaysia, it's a little bit much lower. Much lower, yeah.

FR: And I am trying to assess and I am also trying to improve Malaysian manufacturing frameworks and supplier selection. So I am trying to get, a kind of grasp on your thoughts of, if you think if the same, if you think, if you think they are better.

Interviewee: I would think it's the same.

FR: do you think it has something to do with again, how business is conducted?

Interviewee: Yes.

FR: One of the things that I am looking at is the comparisons  how the Asian industries conduct business, well supplier selection business to be more specific but western.

Interviewee: Oh, Eastern is different.

They are more organized and systematic and things like that. Ours is more like, human touch and human interaction. In the Asian industries, it is more about who you know and who knows you.

FR: You mentioned to me earlier about the use of Alibaba as a source for suppliers. Are there any other social media sites or mobile applications that you use? For instance, Facebook or LinkedIn, or Twitter?

Interviewee: No. LinkedIn, yes, I think, they have trying to link each other. But I don't use that

Actually, as I said, one or two of my colleagues, they use a lot of apps, I don't know how many of the apps.

Interviewee: The other thing is what we gather is the news magazines that we receive everyday.

FR: News magazine? You know the name of it? Is that sent as an email?

Interviewee:- These are E-mails. Everyday – World Steel Association, Steel First etc.

You have to subscribe, It's only for people in this industry, we have subscribed to all so we get them.

FR: World steel news. Yes. Okay. But this is a website or is it a magazine that you subscribe to?

Interviewee:- See that, there is an information of Malaysia to US. US price, dealer ID, our prices, you know things like that. So sometimes they, so where's is Asia market. This is the, this is US market, this Asia market, then the other one is European market. So we need to know after our CIS. Not American. We are more into Asian market.

FR: But you trade with, which countries in Europe? Do you know?

Interviewee: - Europe is much less, We used to trade, basically we buy from Europe, those, what's it called, stainless steel.

FR: Oh, stainless steel. Can you tell me which country?

Interviewee: Belgium.

Belgium is cold, and we have not bought from them from I think 4, 5 years because of their prices.

FR: More expensive?

Interviewee: It's not the prices, it's the quality. It's the quality that they sent to us.

FR: Okay. Is there any way that you compare your current suppliers, you know who your supplier are, you have five or six, But is there any way that you compare to choose which one that you are going to buy from, from a particular incidence?

Interviewee: Okay. If we need to choose, we'll look at two things; Delivery as in how fast.

Quality, more or less is same And then, of course the next one is the pricing.

FR: But how do you assess the quality? Is there a particular way that quality is assessed?

Interviewee: There is not, we only assess quality when the product gets here. Whether its dented or it is rusted, whether it is caused by the mill or caused by the shipping.

FR: So in the case of this company, the supplier selection criteria would be delivery time, then pricing, then quality, because quality is only assessed when the product gets to you.

Okay. Okay.

Interviewee: Then we would assess the quality, if we have a bad experience with the quality we drop this supplier.

We go back to them, we go back to look the first quality, the first demerit we spare. Okay. We want usually second time it comes, we don't have much issue or we will tell the suppliers, because certain products, we have no choice but to go to them.

Hmm. Of course.

Because it's their specialty.

That's their specialty.

FR: Okay. That was my last question, I think I am finished for today.

So while I am working on this, if I need anymore information,

Just give me a call.

## Case B

FR: So, the first question is, can you tell me a little bit about the company?

Interviewee: basically you understand that our company is manufacturing furniture which we have, of course we have different-different sections which we has providing a manufacturer those furniture for hotels, for medication and custom made, custom made furniture and architectural site. Those furniture for office, office use. For that, for university, and all kinds of those you can see them generally. Okay? And of course we have our different-different divisions, groups, I mean teams, individual teams. We charge for individual division for sales and marketing. And of course even though we are in different divisions but of course most of the time if there is any information that is related to different-different divisions, we also sharing for the latest update of information.

FR: So all of the departments are related.

Interviewee: Yes, like in purchasing we have a total four different purchaser. Okay? Individual in charge for individual section. Okay? But of course, like all those information from like, we are also sharing for the supplier information, okay? Like from what you see that the raw mat is the first most important material that we are looking for. Because purchase the most is the raw mat. Like the steel.

FR: Sorry, sorry. Steel? Raw material, right?

Interviewee: Yes, steel, metal and all this.

FR: So, the some of the main materials that you source is steel and what, sorry?

FR: Steel, steel what? Stainless steel, aluminium and this cool row. Most steel that means like in metal, there is different-different category like cool row, hot row.

FR: Cool row?

Interviewee: Cool row. Cool row, hot row. We coins as a GI as Galvanized, is electoral, we coin as Galvanized and.

Interviewee: EG

Interviewee: EG plate. We coin as EG plate that come with a different treatment. Actually there are so many types, if we want to elaborate in details does mean that we have got so many, many categories. Its just that more or less, I'll let you know the basic ones. Steel normally we are using for great trees, and for, especially for medication, there's a special requirement for their ISOs.

FR: Okay. Can you tell me what countries do you do business with?

Interviewee: Quite plenty of.

Interviewee: Local mostly.

Interviewee: Most of locally.

Interviewee: Some we do in foreign but generally we try to buy locally.

FR: Locally?

Interviewee: Yeah.

FR: So mostly Malaysia, yeah?

Interviewee: Yeah

FR: All right. So in much detail as possible, can you explain to me your supplier selection process?

Interviewee: Supplier process, actually we have a four of ISOs with our company that is ISO procedures that normally we perform. IF you want to see I also can bring up file to show you for the procedure maybe from there and then come with a flow chart and all this, you can get a better understanding.

**NB: The conversation continues verbatim as per FR and interviewee**

Okay. So let's break it down. So let's just say, you need to source and your suppliers so you mentioned to me before that a majority of your suppliers are in Malaysia. You also mentioned to me previously that sometimes you need different types of raw materials. So therefore, in some cases you are going to have different supplier selection criteria for whatever you are building.

Yes.

Yes? So how do you go about finding these new suppliers for your needs?

Basically it depends on, we have to study that company, the background of the company because the stability of the company itself is very important to us. So, I mean, before we consider that company, we have to try to understand that company's function and this because its one of the liability for the supply and all this and whether they are, and after that we will go for the, of course the quality and the pricing.

Of course.

Its quite, its one of the important points.

Delivery time?

Yes, delivery time.

And rest is like servicing and the company performance is also one of the…

Criteria

Yeah, criteria that we are considering. Also, payment terms and all this is also one of the criteria that we will consider.

Okay, so lets just say, you need to, as you mentioned before, if a medical equipment, you need to meet to deny a source and you will also need to source different types of material to build this. Do you go on the internet and you look for new supplier or how do you source them?

Yes, we also look into the internet to source from there, those from alibaba, a lot from there, we can see the majority, we can see the…

Mostly for plastic, unusual plastic. Sometimes we have crisis for putting out unusual plastic

So you use Alibaba. Do you use any mobile apps or any other website or any online magazines or any other cases as your source?

Most for my site, mostly I will try for the internet to see what are the other buyers' comments. Because maybe they have a past experience, a lot there from there or else maybe we can get some info from there as a reference before we move to dealing with the suppliers.

And of these sites, is it only Alibaba that you get your reviews from?

The website like Infopage, we open, Greenbook, Easeonmalaysia, some supplying yellow pages, greenbooks, yellow-pages, all this.

Oh. So people put reviews on online yellow pages?

Mostly the suppliers themselves advertise their companies inside those, all this. So that's where we, something for the product range from there or maybe we could, like some, we put in the product name and range from there and then we dig up and see whether we can localize it or chase order daily.

Order there daily?

Yeah, because from like what we purchase from overseas, sometimes there might be some licensing problem and all this. So, one of the pattern for us to do the purchase…

Also the volume of the bill sometimes raises high for specific parts and we don't have the volume to buy and buy container rooms. So its very difficult to buying goods container or travel.

Because, I guess, also if you are buying externally, it could affect your quality because the amount of delivery time is high.

Not to mention, there is no recalls in it if there is a problem with the product. We can temporarily buy from China when we require small-small things which is low value, maybe try small orders if they allow us. Sometimes they know there is millions away from this so big so we find that we can't actually purchase it because we will get stuck here for years and mostly because of the recalls. Because here when you buy from a local supplier, we can always say that this is defective and…

You exchange it.

Or pay money, whatever. But it's a free value. Buying from China, you've got TT, you've got lots of money and that's the end of that. So this is about the problem where the volumes are small amounts and these have a peculiar path. Sometimes they require handlers, some clients, they want specific handles, they require from China. But these are always small numbers and even small numbers you find that they far exceed the criteria requirement and then we end up every year and it stalls for years. So a lot of times today we are project driven. You'll find that customers can actually specify what furnitures or what parts or handles they have and this way you have a problem because we are project based and we are not serving you like retail or consumer product where we just want it as it is.

So, the majority of your work that you do, it's a customer pleasing a particular order.

Yes, for a particular project or a particular construction or development. Even in hotels, you are finding that they are building a new hotel and the architect and designers are called with a particular design.

Different-different ideas.

Sometimes all get to all. Even then they allow to say one of its favorite, they want this color.

The powder and these all different-different type, then is based on project base.

Great, great.

That's all right for us. We need to be very conscious about buying materials because you'll find that, you'll be stuck with there. Because they'll always be there meaningful always like this whatever you buy. Even like for me where I do look voluntarily for each of those clients who want their color, I say no.

because if I buy this, I'll buy x number of bags, powder and then what am I gonna do unless you pay me the difference. And all times they are like, no, no, no. they are of type two.

And some of, there is expiry for certain things as well.

Yeah.

We cannot keep for too long.

So all of these things you take into consideration when you are sourcing. Okay. So we covered that and we also covered how do you locate your suppliers. Okay. We also talked about your supplier selection criteria, which you mentioned to me was the background of the company, reliability, quality, pricing, delivery.

Servicing.

Service, performance, payment dues. I guess I can insert like expiry date and stuff of requirement.

Yes, yes. Like certificate as well.

Anything with ISO.

Yeah. All this is inclusive in inside ISO. Of course the pricing is not much touching in ISO because procedures and process is on quality.

Because in research, in supplier selection research, we have identified twenty three main criterias in which suppliers they seek, they look at. And some companies that I have interviewed previously, they use mostly three. But in your case, because your business model is different where you have your focus as project based. You would actually maybe consider all 23 of that. As reliability, that's one of the 23 healing tips. You would also look at the stability of the company. I think that you would be factoring in all 23 at some point when you are doing it. But in the event that you don't, is there, if you are dealing with a particular supplier that you have dealt with over and over again, is there anything that you are looking for? Like reflexive pricing, or delivery time. Is there like a category that you look out? So I know which one comes first, second, third, fourth.

Of course, like those I can, if delivery time is one the mains, I think is for our consideration because like normally for a project that we'll have limited time for us, for the deadline and all this, especially if are doing responding now for the shipment and all this. Okay? We have to load the shipment and take all this out ourselves and from there if, why I am saying like this is because if, let's say we have two companies, one is A and one is B. no matter if, let's say, this company A no matter how good price they mean to give us, but the late time is, cannot be avoided by not a single point, this is not we look for. If like maybe from there, if company B maybe there cost is slightly higher for 10-20%, we have no choice to absorb the cost, I mean to meet our deadline. Because, other than, of course for the better, we are trying to not to disappoint our customer. Then we have to buy a single, of course for the price we were trying to bargain from our suppliers to get the best price is I means, in other way, we don't want to bring up the cost to leash to let our customers to bad service.

So basically for you, in your realty, you'll, kind of, sacrifice pricing for delivery time. But do you sacrifice quality?

No. Because the quality is of course, if we purchase they are able to supplying to us for the, I means, the low quality material, we also not consider it for booking.

But then again, if whenever your main material that you buy is steel, I am assuming you already have a relationship with people or sales, these things. So yeah, therefore you'll be aware of the quality anyway.

Yes, yes. Because like for our company normally based on our company, normally we'll be slightly different for some outsider. Like for us, we'll mention even inside our purchase or the packing for the item itself because some of the supplier maybe, some of the furniture manufacturers maybe they'll request us not any, that mean, their requirement will mot be for the raw material because normally when the, of course we are not direct purchaser from this mill, manufacturer because normally what one time their purchase is…quite big

Huge.

They will sent to the service center because from the coin, all this is related, means they will cut a lot of process there which, since we say that our purchase is based on project base, we'll often complete for the quantity and all these. How much money we need to use for a certain project that we'll purchase from this builder.

So it works like this. You have these mills, and you have that buy from these mills, so you have that middle person for buying from them.

Yes, yes. Because we really are in, not afford to take that huge…

Risk

Yeah. Purchase from the mill that will maybe few thousand tons or what for one time purchase. Therefore they will directly refer you to, oh why don't you all direct buys from our..

Distributor.

A few hundred tons or what they, that they are supplying other than one time purchase.

Makes sense. So my next question was, can you explain if there are cases where supplier selection criteria will differ from the usual process which you, kind of, explain to me because all of your work is project based.

Yes.

So I guess that is a daily occurrence for you coz its not the same product that you are making.

Yeah, yeah, not the same thing that every time we purchase. Not the same. Every time is different-different and some of, our divisions they are different, and so maybe their usage. Of course some item like raw mats is a must to purchase. Other than that there is still a plenty of things like fabrics, like..

Plastic bags.

Plastic bags for all this, all different-different.

But the criteria would still be the same, delivery time is always going to be number one.

Yeah.

All right. And how are these suppliers evaluated to be a part of your supplier list.

Don't mind, maybe I can bring up a file, I'll show you there, you'll get a more clearer picture. Okay, now you want to know how longer evaluation for the customers and for the suppliers. Yes four has one, we

will have the standard. This is one of our highest offers here. Okay? Majorly we'll put supplier in different-different category which rather is acquired, approved, provisional. In three category. Of course in each one of that area, for a new supplier, normally we will, after we administer to check the background or all this and the buyers look there and all this maybe to get a sample and all this. After the process, our process, then we will put steel or put into a port supplier and get management for approval for realize anything like that. But for the regular assisting work, we will normally put into three category, which from there you can see that.

So we prefer ones are the ones that you have already..

This three also our assisting hand, this three category we'll put it like upper we'll used area, we'll do once more supplier evaluation. But how the rating for this three category is like, we would put into three balance, the purchase for each year, more than twenty.

So you go by cost.

Below 20K, we will not touch anything because we've got too much of suppliers. We're unable to really go into.

Yeah. How many suppliers are there in your supplier list right now on average?

For every year we have update.

Update.

Of course some, like performers, are very lousy or there is a one time use, then we'll erase off at least a few hundred.

And this is how you rate.

Yeah and all this, I just want to show you is like the figure we purchase a year is within the range from 20k to 50k like we'll select two PO from that year and 50k-100k is 3 PO and above 100k is 4 POs from there. From the PO reserve we can see how the supplier performance, based on the purchase rate until the delivery date. So from there, of course, in the ISO, the pricing is not much we chew because they small on quality and all this thing.

Delivery time.

Yeah. So from there we will select, we will tick off the, when we do pick a few according to the base and we'll summarize it up and see how their performance is. From there we'll put everything. I can show you the lists.

May I have a copy of this?

This one?

Yeah.

I've to get my ID so I'll queue them up for above person before I give you a copy. Okay?

Sure.

Yeah. Because all this is under…

Its controlled.

Yeah. All is under control. Like this is our evaluation form for individual. Just now I mentioned through year from year, after we get the PO, we'll type the PO number here. That means we can chose that how we evaluate.

Now, wait, wait. This evaluation is for current suppliers. What about new suppliers?

New suppliers basically we have another…

Coz basically for the ones that you currently have, you use your rating scale and you go by the purchase order between different amounts on an annual basis. So, for the new ones, how do you go about.

Let me show you. Contract A. because the new one normally we also will get the trade quota. Like even our existing one, sometimes we need to know the market price, how, I means, how long they, I means even they are quoting us for current price and comes at all these things. But we still will get some new sources to try to compare.

How do you get the sources? Where do you get the sources from?

Like sometimes we go for the exhibition and all this. We need to know the new suppliers, and even some new suppliers that get known to our company, they will try to quote, to fix the employement. Yes and send their catalogue and all this to introduce themselves to us and from there when the projects come, we'll meet them us to see..

Do site visits.

Yeah.

There is no form for years of buying and…we go by quotations.

Actually, yeah, we go by quotations and all these and we'll be more accurate and all this, I'll go through the email and all this.

As well as I was actually trying to actually figure out is, for new suppliers, I was looking any different ways how you find them. That's one of the things that interests me is that how you source them. Coz you mentioned alibaba

How we are sourcing for a new supplier?

See, you mentioned alibaba.

Yeah, like alibaba, greenbooks, yellow pages, all these, and from the exhibitions and all these. Sometimes we also go into the web page through client research.

Web pages.

Yeah. Because there are some, like, steel society a lot from there. We can know more. Okay? Or sometimes we know the certain grand a lot. We'll try to maybe contact to the HQ and from there they will refer their distributor, representative office, sales office locally and all this. So from there it's more, more easier to get sources.

And then you send quotations.

Yes. And from there, because, for us more and more item is based on the project baseline. That's why we've got a lot of this drawing that incur. That's why we have to invite them to come down to sit down with our marketing and our engineer and our R&D to sit down to understand the things and for the discussions of the details. Yeah. That's why, like just now you mentioned that how we get to know the

supplier and the procedure to approve the new supplier. Sometimes there is not only for the people to get the approval and all this because all this we have to go through a long process for the discussion and all this because its not only for the purchasing itself. Of course our GMs and our this engineers, our R&D plays very important..

Important part coz you need to actually innovate the materials that you are buying and then take them to…

Yes. And some, some of the chemical things that maybe from there, they'll get more information rather than.

You are using all of the 23 criterias. (laughs.)

All this to know the ethics of the clients we work with.

Yes. And some certification.

Yeah. A lot of the time they say they have such specs, specification but they are not fully qualified. And that's why we have a discussion whether we can unsack or whether the client can unsack. So these are things that sometimes they base their process because we tried to go. Sometimes which are ban we can't find is, you know, that at this point of time you can short notice that ourselves only want to incept the alternative. So all these things are evolved a law of discussions.

And of these could be issues which was one of my other questions. The issues of your problem that come to mind with supplier selection process. So it will be like your discussion, your meetings and is their limitations seems finding any of your supplier for what you are making is that one of your problems?

How do you say this? That's why we more prefer to use a local supplier is because of our products are small or based on project based or sometimes is special custom made. That's why we have to have a direct discussion rather than go to conference call or to email and all this is more clearer. Otherwise we have to spend some time to get their sample, to coming in, don't leave from there, we'll have a outcome or what.

So basically, a lot of your problems come with merging of all of your departments. Coz you have all of these different people and different departments merging to meet this one project. So in each department you'll have their own different problems so that in your case it will be delivery time,

Pricing.

And pricing, yeah. And then you'll have from the R&D, you'll have what it is technical ability.

Yeah. Because sometimes the R&D maybe what they are designing out is more ideal but practically maybe for engineering, they will give some input and give them some output then we'll say that maybe there is not that balance for practical use, its not that suitable. Yeah, that's why there is some, most say that conflict is more from discussion and understanding certain things.

That's when everyone comes together. But is there ever a time when you are searching for a supplier and you are not able to source a supplier locally?

Yeah. Like so special, like some special things that is very rare in Malaysia, use based on the culture or like this. We have to no choice to get from overseas. Then we will, from there we have to spend more time for the discussion and all this because every time maybe we'll have some conference call or through email and all this sampling and all this..

And do you find these suppliers again from alibaba?

Sometimes yes.

Is there any other sources that you look for, you look into?

Because for I myself, because we have different-different purchasing. Sometimes we'll exchange the information with certain, also like somes. Maybe they'll get from some other sites, they'll get the, I'll introduce the client for the day because this is our project and my product. So from there I'll start to raise with the suppliers.

That's from there, the existing suppliers is wrong. Because they tell us they don't have the product by so and so, but don't.

So with the most.

Yeah, also they will, in ways refer over.

Yeah. Sometimes our local supplier also will introduce us.

All right. So I am now moving to the technology part of the interview. So what are your thoughts on having information technology or, and or business intelligence and or artificial intelligence support for supplier selection. Do you want me to explain?

Yeah maybe…start from..

You are talking about some kind of program or that.

Let's think about your decision making process. Yeah? Do you think that it would benefit coz as I mentioned before, I have visited different companies that are completely manual. So they only deal with the most and they probably maybe go to a directory or they probably look at the people that they know and they source their suppliers. But do you feel that having information technology or business intelligence, which could be something equivalent to Microsoft Excel, or SAP or an ESRS systems. So you think that it is beneficial for supplier selection?

Yes. Definitely. And even though now for Malaysia are we, actually even WhatsApp also one of the…

Really?

Yes. Quite, I means, regularly we use.

You use WhatsApp?

Like sometimes we'll buyers and suppliers and all these and they will send the things from there. Also actually, its fast. Its fast. Especially when outside, and you have no time to open the laptop and send the E-mail for. Of course all this we still though get into the positive when we are back to the office, but hold up when you are out. WhatsApp. Because we are not dealing with one supplier. Maybe one day they are plenty. Someday they are calling or what then we have to see the documentation we have copied. Then maybe from WhatsApp there, send a photo for the product itself to have a better view for understanding before you go back to the office. Then you don't waste time. You just different. I think, in Malaysian culture, current culture, actually is quite useful. I can see that. Its not only for how much you check.

The kind of technology you are talking about, I kind of, described about having a program where you can steady your diagram. Keep them points. But creating a core and analyzing a while, this supplier is good, you know, its still a subjective because you need to, she needs to put it reliability, pricing,

Yeah. I'll show you the format right now. Yeah.

So, its very tedious but..does it improve, you know, the selection process, really? It does give you a database though. The ones that you've interacted with so you can actually recall that from data. In a way, that's good. Like foreign, I think when we have the supplier, we'll have some kind of recall and the survey and the bad ones, of course we will blacklist them.

That's why the rating, we put in there. Like Apple, like once we've done, we do the, we evaluate the supplier after..

One month?

Yeah one month and from there we can see the, how's there performance and all this is because the firm is not just rating by purchasers. Of course, to our this, QC, QAQC, because from there we'll know like the yearly, based on what we selected, to a certain PO from there. From the time of purchase, how they perform from there. So our…

And do you use any IT tools to support that?

No.

That's done manually?

Yes. Because from there, we compile everything then only we put into Microsoft and generate the total.

Okay. So that's actually my second question. Sorry. Do you use any information technology to support your process? So is there anything that. Okay, so you go out, you find, you go to alibaba, you do whatever you need to do to find your supplier. You evaluate, you go through all of your, your reliability, all three selection criteria. Is there any thing, information tool, it could be SAP, Excel or anything that you use.

We are using our ERP system no?

What is the name of it?

ERP.

Is it rare, I can't remember.

Yes. Enterprise Resource Planning system.

Is it rare?

Side lines…

Side lines?

Side lines…

Its an American thing? And is Windows based.

Windows based.

So we actually use the..

And could you tell me what are the things that you input into side lines? As in is it company name, location, what do you put in?

We input some, all the information. So the certain..

We generate the PO from there.

Yes, we generate the PO of course. All the, like, marketing they all also can do the, they can check the information from there as well.

So all of your systems, all of your departments..

Yes. From marketing to logistics, that means from head to toe, we can all complete inside, the information inside.

And then, this information is recorded on your supplier selection list or preffered, coz you..

Actually this, for evaluation is not used

No power there.

Yes, not, not.

Despite our ISO we can…

Yes, its ISO.

See ISO always has this hard copy, filing system where everything is, you've got to print on paper. Yeah, documentation.

So, and with documentation, with the management approval, with the Q&R approval, and always. Of course we are legal on the stamp post.

The entire matter there, you'll try to enter it or yeah actually looking to..

Put it on…

Yeah, more and more when signatures are done you know, in the system. I'll sign off, moving away from people. But right now they are real obsess, its obsessive to do copies. How many copies can you keep on, always keep that..

Of course.

So you have a balanced amount of 5.

So, now your supplier are stored manually, so by paper. That's a lot of paper.

Yes. (laughs)

That will definitely be a lot of paper. But do you feel that in your case, since its done manually, then amount of suppliers you have, where do you in your opinion, coz you were just mentioning that the auditors are obsessed with it, but do you think it will be beneficial? I mean, because you'll just be thinking about it in less people or whatever. But do you think its beneficial to..

That's a very, is more environmental friendly that less paper is more backedup.

And easier to search that.

Yeah. Easier for searching.

You can scroll through your history with the supplier so easily, instead of now you have to dig up for hours 1 to 10, you know, and you have to look in every corner in order. You have to flip though…

So all of your list, so all of your suppliers is not on your ERP so you just generate. So what do you use the ERP for?

No. I means it is…

We just started within a year.

We just started for I means for life using for this year. Because due to our GST and..

GST stands for?

A…Government's Service Tax.

Oh, the GST.

I think that's a GST or..something.

Coz we were looking at it from last year but, we just implemented using this year.

Yes. Yes. Oh the ones we have apparent plans from, before that.

From January I think.

This year January then before GST because our GST is I think poor. Before that January, we are start using.

So, what you are using the ERP for right now?

Okay, the ERP system actually is quite, we are using for 4 divisions. All divisions, from the purchase, from the customer, all this. All the information actually is inside.

Hmmm..

It is like all the modules like finance, purchasing, inventory,

Logistic, inventory, warehouse, marketing,

Production, marketing, all is supposed to be integrated. So of course we have just look out..

So you will eventually put your suppliers,

We will build up a database.

So the event is getting there?

Yeah, its really there actually its only for the evaluation, yeah people are looking for this thing. Evaluation on the book is more on documentation, support because of the ISO procedures. They have to see that.

They have to see it.

Yeah. Then we have to choose.

So the rest for the, like the purchase and all this, for the payment and everything now we are using this ERP.

Good. Excellent.

And all the divisions are linked together. So that, what we have already purchased and all this, even for marketing or what. There maybe, to be after they are pull in the passport for certain range, they can see the different-different info from there. But whether the things they show to which part, which part is whether the warehouse or we only purchase but waiting for the delivery and all this, that can see only this way.

Hmm. Could you tell me what is the information that you use to record your supplier? As in what type of fields that you use? So like, name, location, types of, type of..

Purchase order.

No. not the purchase order.

Profile.

Yeah, the profile.

Okay.

What is on the..

The category?

Yeah.

The category for the supplier, contacts. All this is majority. We'll put inside.

Hmm. Coz I am very interested in that rating scale.

Rating scale?

I am very interested in that. I like told you segregated them into 3 different…

Yes.

Categories. Coz it will actually make it easier for you, for assessment and then after the assessment, of evaluation, they again go back into a list and then some of them goes out.

Yeah, yeah some will go out and some, if like, they fall in the category, is between 50 to 60 point, the rating. Like after half year, these will go back, we'll evaluate that and see whether their performance is any improvement or not.

Hmm.

Okay, if for some time, even though their performance is not that perfect but they are still using them, we have no choice, because they are…, some leave really no choice, to be very frank. Of course we will still put the comments there.

Okay. And you will obviously, you record the times of, the types of usage, I mean times of the amount that they use. And you just explained to me your auditing process as well. But is the auditing process is done on paper itself?

Yeah.

Okay, so I don't need to ask you that question. You explained that to me already. But are there any problems or issues that you are currently experiencing with the, with this new habit? As in manually?

Manually? Storage space. Definitely because there we are not just keeping for the latest one of course. The past few years, we still keep as a reference sometimes. In case there are anything important to use, then we have no choice to pick up from warehouse.

But how accurate is your data? Is there a case, any cases, let's just say, okay it goes through auditing every year, but is there any case that during the year, that your information is incorrect? How do you update your manual files?

We review every year.

So what happens if during the year something changes?

Something changes?

Let's just say, okay, so some of the criteria that you

Of course we will take access to our internet.

Yeah. We will take action when we need. Evaluation is just,.

This is more of a historical thing,

After we purchase anything, then we just go back to, that this year we will evaluate based on last year's data. If current, of course, if they have any changes or anything like changing of the company's name, or,

You will know.

Yes, they will send, definitely. Supplier normally they will send us a manual and all this and from purchasing, we will send out an E-mail to the respective division like they have to know, for all this info. So from there we will do things.

So what do you say that the problems that you experience with the current system will just be searching?

Yeah.

Because it's a lot of information for you to just sort through and if you, if your data is correct, that eliminates one of the problems. Seeing that you are not using any information technology tools to store it, that eliminates another problem. So I am assuming that the only thing would be searching.

Yeah

Is there any cases where your files aren't up to date or something was missing or..

Yes, definitely.

Even sometimes we have to trace back the old, I mean the older times, all these things and sometimes also we spend time searching. Because we are, I means our division also they are field tracks and all this. Sometimes different person maybe, their handeling is different. Sometimes they'll, maybe we have to check all this. Of course, all these things, we are not using daily.

Misfiling.

Misfiling.

Yeah, misfiling human errors and all this. Definitely they will happen

Of course.

So everyday, everything is archived in the system, then its good.

Its more easier.

Exactly. Yeah. Which was actually my second question. Do you feel that it would benefit from having ICT support? Because you'll have everything in one thing. You'll have like a file for one person, one company and everything is there. All of the historical data is there.

Yeah.

That was like, I mean that how many, because how many suppliers do you have on average?

Few hundreds.

A few hundreds. So imagine you need to locate these suppliers, that must be very tough.

It's a cross referencing thing.

Yeah.

Manually, when we need to do, we call up a particular project or a particular product and then you, you can recall what's the supplier. As a veteran you look to the files and curtains. Cross reference, so we have a system as well as instead of, it can be used in product, tape to the supplier name, it could be brand.

So do you think that the current system that you have, well, when you integrate this information into your ERP, do you feel that it will be more efficient? Because one of my goals for this framework that I am building is to integrate artificial intelligence and it is supposed to increase efficiency and effectiveness. Now what its going to do is, its going to take, in your case, for an example, side line, and is going to extract all of the information from side line. So let's just say you need a particular material, you'll tell, if for the framework, how it works is you say what you need and in this part of it here, which is the intelligence phase here, I am looking for the different types of ways that you search for your need. So which is why I was asking you about alibaba and the different places that you source your information from. And whatever business intelligence tool, which will be ERP in this case.

All right, all right.

Yeah, or if it is you use any databases, do you use Excel at all? Microsoft Excel, to store anything as in databases?

Yes, yes, yes. So that is for our individual, we do our data or work, we still will use PowerPoint.

Yeah. This is it.

Yes. And this is for write data and all this for Excel and..

Of course you do SQL.

Yes.

She does a lot of comparative study to get there.

Because before we go to, I means to propose to the management and the marketing, we should, the supplier, we are proposing to you, of course we have to prepare all those.

You have to do reports?

Lots. And all these, other than the comparison, then we have to pile like, what is the demands that they have to, we have to considering before we go through the management.

And is side line going to provide you with that, reports?

No.

No, just time line.

Oh. So you would have to do it externally with Excel?

Yes.

And when you are using the Excel, could you tell me what information is in the Excel database?

It depends on, what we have to report.

So for each project, its different. But what I am trying to, if you are doing data mining, what I am trying to understand is this. So data mining, or you are putting reports. It will be, I am assuming, different suppliers,

Yes.

With different prices

Yes.

Different delivery time.

Yes.

And all your criteria.

Yes. And you are basically putting up a personal report. Also, all of them and you are assessing your risk, or you are assessing all of the buying capabilities and that's what you are doing with it.

Yeah. Because from there, it's more easy. After you memory everything up, so from there basically its discussion and all this. Sometimes, we also, maybe there are some points that we are overlooking that. So from there, based on the discussion, sum of it can come up.

Okay. And is this also done to select new suppliers as well?

New suppliers, we will put inside the, one of the comparisons lookup. That is where we do the comparing before we selecting the, which..

Before you select new ones.

Yes.

So when you are making your decisions for new suppliers, do you sometimes, okay, let's just say, you have a particular product that you need to make, do you often, or does this happen at all, do you look at your current suppliers and do you also look at the new ones, and compare new ones to the one you know.

Yes, yes, yes, yes. That's why just now I told you that, other than the current one, we, sometimes it depends on the item itself. Sometimes we also will invite a new supplier when get known from them that we are from there to picking to seek. Its not only for the pricing.

I think also when the volume is significant for a new contact, so that gives us an opportunity to get more, inputs and more suppliers. This of course, is, right now the volume is very lower, then sometimes the supplier from the existing ones. Originally when the volume is big, it consists the opportunity to..

To have a, by bargaining, yeah, bargaining, have a

Teller pricing, then quality, yeah.

Does that actually mean?

Yes.

Because that's not really common. That's really good.

It is of course for the systems where they are buying regularly for fixed numbers. So there is no room for flexibility. Of course though, you'll get a project in this but fact is that you are buying big, previously we haven't been buying big. It gives the opportunity to get better pricing and better suppliers. Previously, you know, some suppliers, they had only interest for and then we'll supply you. So you buy from maybe a second tier supplier, but now you can actually upgrade. We get a better supplier, better pricing.

Hmm. That's actually, really, really good. That was actually the last question that I have. But as I mentioned before, if you can get permission for the..

Ratings?

The ratings. As well as, I don't remember I mentioned before, I would like, when I am finished with the interview, what I am going to do is, I am going to firstly take out the important points and you've given me a lot. I really appreciate it. Especially in your case where you are project based. Which mean, every single purchasing decision of yours is going to be different. Versus companies that buy, buying the same products to produce the same product. So they are buying the same material. And this is really interesting to me. And what I am going to do is, I am going to actually build this. So I don't know if I have mentioned before where if you, if it is possible, your past decisions, if I could have access to maybe two or three, as in your result, as in the, your decision making process and your result. So I could run it, it could be past, it could be even two or three years old. If I can get permission to have that, so I can run it through my system to test it after. So I don't know, I know it will take some time for that to come back to me.

All this, I still have to get the authority because all those,

It could also be a nunamized. I don't necessarily need the name of the company. We can just, like, you could take it off and you can say company E to me. So it's a nunamized. But at least I know at the end, it's not, if it is my, after my result, it will be company E orders. That's what I just want to check. That's the purpose of it. To see if this works. Because what's it supposed to do, its supposed to give me different options for different suppliers to match what you need. It's actually what you do. It's what you compare new suppliers with the ones that you have. To see which one is better. So, that's why I am interested in it.

Yeah. So I'll send you an E-mail.

Yes. We'll talk to the management and. Actually you want the whole process of it. Documentation of the whole process.

No. not really documentation. But what you considered. How, what you considered to get to selecting that supplier at the end.

I am trying to check and see whether the flow chart, you want. Because from the flow chart, that can also give you an idea.

Yeah. If your, coz you actually showed me a little bit.

Yeah. Coz in it you do not need to, to have to cover the names and all this. Maybe you could just put it.

All I need is what you chose. What you chose, your decision, your end choice and what was your criteria that you used to choose that person. So I can have it, so I can run it through my system to see if the answer is same or it will be different. Because I will also integrate alibaba. And I will also integrate, as you mentioned, the green directories and stuff too.

Yeah, yeah.

I'll put all of that in.

Even the tubewells, all these books, yahoo and all these.

I am going to try to figure out, because you've put another interesting point to me, which is the first time I've heard. WhatsApp.

Yeah. Actually for look up currently, we are using that, actually it's quite useful for it.

Coz also I've heard of different companies, they use an Apple. I think they see its ECCM or something. It's a mobile app. And you mentioned that you look for different types of raw material. And from what I understand that app does, I didn't download it yet, but it tells the different type of what you look for. The different components of the raw material that you look for. Maybe you can have a look into it. ECCM. And they also, you're able to source supplier from there as well. You could look into that. So I am going to try to factoring all of the different ways that you can gather information to search from it. That's the overall vision and plan. You see what that was.

It's trying to ensure ways that you look for suppliers for a new product. A lot of times there are on the website. There are all phone numbers, there are all.

Yeah. There are known updaters and all this.

Actually. I had an interesting experience about last year. I was doing questionnaires. That's how I ended up having to do this because I looked there is a book called the Federation of Malaysian Manufacturers.

FMM.

FMM. So I took, I looked at all of the companies above employees of 150. I put it into a database. I literally sat alone and typed all of them and came after over a thousand companies. And the point was, I was supposed to send an E-mail with the questioning to the person on the directory. I was hopeful for about 200 to 250 responses out of maybe a 1000. I got 8.

Wow.

I got 8 back. Because the majority of the information there is not correct. They were not correct. And some of the people that we E-mailed, it was even like, a general inquiry type of E-mail address and no one responded.

Wow.

Then there was the other case where they put people that just didn't want to respond to it. So I got 8. Yours also included. Thank you very much.

Its true because that's the culture generally where, first of all, they exaggerate what they make. So when we contact them they actually don't sell or make the product. So, but they pre-handled and they put a lot of things along this product. So actually they don't make it but they don't have they courtesy of telling us that they don't. so they just endure the inquiry we send them.

So are you trying to say that sometimes they tell you that they do something and they really don't.

Yeah. They just put. Yeah.

Because they just want to, like wider their range.

Yeah, yeah, yeah.

Especially, when they, they, when you call them they say that they once previously with that, but we stopped production for this thing or obsolete or certain things they will tell you the story, which we already get used to all this.

So when you email them, or through their contact page, they don't respond to you because they don't actually sell the product.

They really do things like this?

Yeah. They don't have the courtesy to actually tell you that. But when you call them of course they have no choice to say oh we don't have this anymore. We don't make it. But a lot of times this is what happens when you do a search out an email search. You have all these company names or websites. And you check their website, yes they say they make all this. But when you call them, if you E-mail them, worse, because they don't reply you and then you know they obviously don't have it but you lose time and…

Of course.

Yeah. Because you get all excited when you see the product, exactly what you want.

What you want, yeah.

Yeah. Especially for those very hard, very difficult to get in the market. Once you get it you, that. Sometimes is very disappointing to us.

Hmm. Coz the amount of time that you've taken to actually locate them. I know. I was really, I was really confused as what was going inside. I thought it was me but then my dad was explaining to me that it's a cultural thing that some people, they mean it. Either A, they don't want to give you information coz you are coming as a foreigner from England coz I am messaging them from England. And sometimes they just don't want to give you information. Because I was here two years ago doing preliminary interviews to build this. In first place. And I interviewed some companies and they literally have nothing. They have no information. They didn't even have Excel. They weren't using Excel either. Which is one of my main findings that the information technology presence in Malaysian manufacturing companies

is quite low. Is literally quite low and I believe that it will definitely benefit more from having the support of information technology.

Definitely.

It may not go as far as artificial intelligence. Let's be honest here. It may not go as far. However at least even if you integrate business intelligence tools, I think it will at least help as if you're doing ERP, it will definitely help. And you may even see some benefits and you may even update and you may even evolve in years to come. But some companies, they just don't even do that.

Oh because in, not just in Malaysia, I think generally everything is financed through even. So, first accounting is there, historical data tracking is there. So basically everything is driven from finance. So they don't want purchasing, they just record all the transactions they will make. So a lot of companies they won't go through all the best thing.

They don't want to spend the money.

Yeah, on such software. Because everything is determined by the accountant who is always very close to the boss. So everything they buy will be finance or accounting based and this is what happens in most countries like Malaysia.

What do you say, this is an, it's something in Asia overall?

Generally I think it, many, many go to inquire few industries, they will construction company. Because the finance director is very close to the owner and he gets what he wants basically and when, say procurement proposes something, they will say perform. The way that you serve them. So this is what happens you find that, every thing is financed here, even inventory systems, they are purchased always. Because, finance they say that there is some tired stock there that's why they want it. So everything is there, driven by finance. As always the case. And a lot of the times, this system is useless to users like us because they only serve their purpose to record. Yeah.

In the implementation of side lines, are the users having any difficulties in using the program?

So far they are. I think after a few, these,

Trainings?

Yeah.

Like you have trainings for it.

Yeah.

Are the trainings provided by side lines? Coz that's also a problem that has been uncovered. Even though some companies, they do have the ERP system or the business intelligence systems. You may find problems in utilizing full capabilities of it because of lack of knowledge of usage. Coz as well as even lot of knowledge even falls into you're not being aware of what is the rest of your suppliers out there that could provide you with what you need. And this is what I am trying to do. I am trying to broaden the supplier selection knowledge base for manufacturing companies. That's actually my main goal, is to broaden the base. Coz, especially in Malaysia, that I've realized that most businesses are conducted. In your case its different.

This is yours.

Sure. Most businesses are conducted by friend of family, friend of friend.

Yes, yes.

Mostly. And in your case, from what I realize, you actually look beyond that and you look for suppliers that does not have that relationship. And it comes as a great limitations sometimes because you are not utilizing what is out there and you come at disadvantage sometimes because you could get better pricing. You could get better quality. You could get better delivery time from someone else.

Yes.

But in most companies, that is not what happens. So that's also something that I found that I am trying to recall as well. Because I am thinking of comparing it to western buying patterns versus eastern buying patterns. But I haven't decide if I am going down that road yet. I think I am just going to focus on this. But its one of the main findings that I have found after listening to interviews and that's why this company was very interesting to me.it is different. I like that.

It is a big difference.

## Case C

FR: Okay. So can you tell me a little bit about the company?

Interviewee: Company? All right. MSM Metal. We have a few subsidiaries. So this is the main headquarter where we are doing a whole unit of products, supporting to manufacture frameworks, coverings and also anything custom made requirement from customers. If you do sketch, you can convert it into a design by autocat and you can fabricate from that. Just name it, we can do it.

FR: So its basically a project based company.

Interviewee: Project. So this is MSM metal industries. And in opposite factory is McKanault industries where Mr. B.K. is GM over there, fabricating for oil and gas. Specialized for oil and gas and we have one more division where it is called MSM equipment. So we are doing refrigerator, commercial refrigerators, and also kitchen equipment for burning like steamer, power steamer and cold steamer and all the export and also local usage. And we have another two more outlets- FIC and MSM Marketing. We are doing some trading products and also custom made fabrications for franchise outlets like Alto, we have Zero tube oil and seven level. So we are moving not only for the hawker stalls we are moving towards to the franchise restaurants.

Interviewee: Right now we are also doing the mobile kiosks.

Interviewee: Yeah, mobile kiosks. For the buy and goes. So this is small cost, when the young generation prefer the mobile, system made just in buy and go. So in this mobile, the pricing should be lesser because no rental charges, so that means you can move. And in addition, MSM is also now venturing into the food. FMG. We have like the Great Feel Audio Soul in Front Bay. Café. So, we have a few more branches that's recently.

Interviewee: That was good and young into, into the MRT.

Interviewee: The MRT project is his project. It's a zero. The customer, of course they are doing for Malaysian MRT but this is from France technology. So in order to meet their requirement, its not easy. We need to have technology. We need to have right people to listen, to source and then to fulfil their

requirement. Its not easy. So that's why after we finally go through so many discussions, so many quotations and finally getting there almost in stage of doing prototype.

Hmm.

Interviewee: We only do a prototype without readjusting also. Just to, of course to attract the customer. But officially, I think they only should built to do a prototype.

Hmm.

Interviewee: So we have another two automations company, one is called Max. Max steel. And one is called Fascicle. So Fascicle is more focused on combat system and Max, it is more on semi-tall industrial machines. So they are doing for semi-choice vendor like Apple, like Western Digital, CK. I mean for their productions automation machines.

Interviewee: Hmm. Doesn't matter how here is your EDOS. Okay. But can you tell me what countries do you do business with?

US, Germany, Indonesia, Myanmar, Vietnam. They have now started referring me to India. Singapore. Thailand, Indonesia.

FR: All right. So in as much detail as possible, can you explain to me your supplier selection process?

Okay. Supplier selection process. So we, this process must been registered under ISO. So this is the procedural details.

**NB: The conversation continues verbatim as per FR and interviewee**

Okay. Before we get into that, could you explain to me what does this ISO mean?

International Standard Organization.

Yeah. I mean, but what is the requirements for you to have this to meet an ISO.

Okay. For me, ISO is something which we practice. We already has established. Then we register as ISO practice.

Okay. Is there any particular criteria that the ISO states that you need to have to run as an ISO practitioner?

No. From what, in our practical things, what we practice here, whatever we do, we document it and then we do what's in the document. Like, people we say, do what you write, write what you do. So don't do extra all the time. So if you do extra then we need to give revise and revise for procedures. Then this is to be documented into ISO.

Okay. All right. Okay. So the supplier selection process.

Yeah.

Could you explain to me the supplier selection process?

So, a new vendor, all right? There is no limit and no rules to always maintain with the existing suppliers. Okay? So currently any new supplier are a lot. Currently we already have almost about 400 suppliers plus. So we still carry on business with them. So this all initially of course we didn't have any procedure to do a selection I think so. So after we had established, so we start to register and ask the supply into the system. Right? So we have all the, a format bag they need to fill in. What is company,

where is the address, who is the contact person, how much is their investment and what they are doing. So they'll fill in all these requirement and internally, we'll go through few members internally. Okay. Then we will select a KG supplier. If they are already in existing business but just for registration and then we will select them, we approve them, when we register into the system.

What criteria do you use to approve them?

Criteria, first of all they have a good product which we are looking for. Second thing, the availability of goods every time whenever we require. This is the first criteria because without trying them for continuous production we never know how will be the, their capability on delivery and quality. So this is just an initial process. So initial process, normally a big company, we will look always in the financial background because we will buy on their terms and also we will introduce a lot of process of buying. It's not just, purchasing is not, it's not only, you should be well when you buy well, introduce a lot of new process of buying. We have consignment sales. We have a blanket PO all this process. So in order for the supplier to cope with our requirement, they need to strongly and financially. So if they are just a small players, they cannot meet our requirement. They just do a small trading. Then whenever we do some, any buying we cancel, any buying we can push out, okay? So at this moment, they need to stay with us. This is very important. So we need to look at their financial background and all and the people who are serving them, serving us. So this all is important. So we'll look into this because we will do more discussion, then we will qualify them as a supplier.

Okay. All right. And can you describe to me, how have you located your suppliers in the past and how do you, and what has it changed how you located them in the past, to now. To present day.

Located…sorry..

So lets just say, you are looking for a new supplier. You mentioned to me before that you are not limited to the 400 suppliers that you have currently on your selected supplier list. How do you locate new suppliers?

Okay. Of course in the new, there are many ways of managing suppliers. And depending on the management also. Few, a a lot of managements like to have more suppliers because there would be more competition, so we can bargain here and there. And then, there are more managements who are looking for streamline of supplier chain. We don't want to have too many suppliers. So we have limited suppliers, so we can keep feeding them and then we can have, they will only serve to us but still depends on how much is the revenue to them. In order to attract the supplier, we need to have a continuous business, so they will think as a number one customer. So the priority is to always to be there. So that's the reason sometimes we will streamline.

No, but how do you find them? Lets just say you want to build something. Like just say, just for instance, the MRT for instance. And you mention it was a French company and they had different technical requirements to what you probably usually do. And lets just say, you have to source one particular product to make one raw material, to make what you, what they require. And lets just say, in your 400 supplier selection list, your pre-suppliers, you cant find any who is giving you the raw material. How do you go about searching for a new supplier.

So whenever we have a new requirement after we go through the boundaries and things and all. So first of all we will just try to understand is this come under which commodity. Commodity- mechanical, electrical, electronic, so or some other custom made item. So from there, we will try to get, first choice will be the existing supplier. So if this existing supplier is unable to provide this information, we will go through of course the Google will be the searching tool. That's where.

Only Google?

Google.

Do you use any other media?

Main is Google. Because from our experience, google is good enough to be, and then of course we have, we call these as yellow pages but Google is more advanced than that. More faster and google globally, not limited to, okay? So yellow pages is only for local. So google globally. Either we can go for overseas sourcing or we can limit to relation supplier only. So if we are not able to get even on Google, there are a lot of things. So we will ask okay, like a Xerox was experience of doing this before. So we will ask them, I already found, I am unable to find source of information. Can you give your supplier who is doing for you, either in Europe or what? So they will give a contact. So they will tell, MSM will contact you, so can you entertain them?

That's kind of like which is more feasible.

This is whenever like, we cant find. But, I always believe, if something has been done before, so you go anywhere in the world, you still can find that man.

True.

Analyze the new R&D items, something recessional which we will need to invent, I'll search then a custom made prototype I think so is different.

Hmm. When you are doing new products for R&D, you have meetings before with your technical team I assume and purchasing to see one of these two things can be done. Then you look for your suppliers that way.

Okay. Depends on industry being. Projects terms normally we don't do R&D, we just do a prototype. So like the kinsman, which I am mentioning about it is refrigerator, I think so. So there will be, there is a small R&D group. So of course, R&D group must be known in term of design and also, R&D is encouraged to look for new technologies, using a Google also. Because we need to work as a team to discuss. We cannot be like just a sourcing team. I want something to be like this in sourceful means. So if can do sourcing like that, so better I buy and ask assembly guy to assemble so I don't need to have R&D. so R&D need to do more analyze a new product. In term of technical selection. Then they can, once they would get a, then we can ask them, can we buy this item? So, to get a sample is my duty and then while you're doing your dusting, I need to do a broad kind offer an exercise to get on a max production pricings, delivery terms and all the negotiations need to be done upfront before the project is accessible.

That makes sense. So could you explain to me what is the most prominent supplier selection criteria to this company?

Most?

Prominent. So in most, you wanna look at the most. What is the, which is the number one and number two..

Number one. Okay. Number one, of course, pricing. Second, not compromise, its not number two but not compromise its quality. Third is one time delivery.

Delivery.

Delivery. So because pricing, because depends. Certain industries, they are looking for quality. Certain industry quality is number second. So for us its common items. We are buying steel. So steel is a common item. So who can give us good pricing. Of course quality is not compromised.

But. Question- if, you are a project based company and lets just say you are doing projects on a timely basis you are working to meet a deadline. Because of that sometimes does your supplier selection criteria vary? So lets just say, you have to deliver a project in three months and you have to source your material from a full Europolis unlike Malaysia. In this case, would you compromise pricing for delivery time?

Yes. So we have go through this. Some suppliers, they have the material but the cost is high. The other supplier, say I will get for this material but its not in stock. Its not in the hand but the price is cheaper. So at this moment, we'll have internal discussions with the sales team. So this is the price we have lower. And these are price, the goods these have in their hand is high. So is its urgent? We need to deliver this out? Yeah, its very urgent. We have to do so please take this with you. We'll always have a discussion.

Okay. So in some cases, your selection criteria would vary. As is which one is most important.

Yeah

Okay. All right. So can you tell me, if there, oh yes I just asked you that one. How are these suppliers evaluated? What is your evaluation process for suppliers?

As mentioned, evaluation…

You can break this up into two. Would you actually explain to me initially about how you get the new ones. So explain to me how you evaluate your current suppliers.

Current suppliers evaluation will be based on how much is the revenue which is given to them? Because we have 400 hundred suppliers. Out of this 400, not everyone is active. So we have active and non active suppliers. Then we run the system to see how much PO what we shoot to them. So, if above ten thousand, so this is called an active supplier. All right? So we will, we can get it selected for, out of 400, the active supplier is only about maybe 100. So 100. With these 100, what is the criteria we can see how good, how is the pricing, second thing OTD, third is quality and…

OTD is..?

On time delivery. So with new supplier or existing suppliers, I only, mostly and generally if we will talk, QCD and S. Quality, delivery, cost and service. You see. So any supplier who meets this pocket of criteria, they will stay with us for a. If either one is dropped, so its just a matter of time how you can sustain with us.

Well, going back to one of my previous questions as you just mentioned this, is reliability one of your criterias that you use for…?

Reliability in…delivery is reliability. Okay? Delivery is important. Whenever, because in MSM we didn't have a very tight control of delivery measurements in the system. Other industries, okay, now earlier ones, I was in different industries. Every month we would do measurements for one time delivery based on when did the PO issued, when is the delivery time requested but what is the promised delivery and what is actual delivery. So we can do calculation, so we can see how, what is the rate. So, normally 80% or above is considered as median on time delivery. If we saw every time they are

below 60, 50, 40 so these are the suppliers always looking for trouble. And before we disqualify them, we need to look into how important they are to us.

Okay.

Okay. Sometimes we have limited suppliers for certain things. Only they can, only certain suppliers can do this thing. So they are one of them. And maybe they have the advantage of pricing also. So we cannot squeeze them much. So we always need to find touching to them, try to improve, we need to do a lot of discussions to motivate them. We cannot disqualify or throw them out.

Okay. So coming back to, as you mentioned disqualifying. So coming back to my question, about how do you evaluate your suppliers? So you have 400 people, suppliers, on your supplier selection list. And you evaluate them by their revenue. So what happens to the suppliers that does not meet that revenue mark?

So they are called as non-active suppliers. So what happens is not a big worry for customer. Right? Because we cannot, as I mentioned sometimes, while we are growing up, we cannot have too many suppliers.

Right. Of course.

While we are in the development stage, we need to support. Okay? And then we have move of course a lot of advantage but for once we grow and growing and growing, we need to have a limited suppliers to control.

So what is the difference between a disqualified supplier and an active one?

Okay. Disqualified is something, somebody really giving us a trouble, never listen to us and things and all, its considered as a blacklist. Okay? We need a system, a new system we can be just remove the non active so no PO can be wasted. The system is blocked.

How many times, when you are looking for new suppliers, that you contact your non active suppliers? Is there any events that that has happened?

Non active, whenever I am selecting a new supplier,

Do you consider? Okay, so you have one product that you need to build, to make and your 400 suppliers on your list but you already know from past experiences which supplier can give you your material. So when you are in your evaluation process, I am assuming that you are only looking at the ones that you actively use.

Yeah

But what about ones that are inactive? Why are they still inactive?

Okay.

Because it probably, from how I am seeing it, you could look at, you could select them

That's the reason, I say its non-active. I didn't delete as a buyer. (both laugh) The system, okay, if we go use our old way of in exhale, normally if they are not active, our mind will just delete them. So with a new system, maybe I'll show you on the internet, you remind me. We'll just, non-active. So, but their name is still there. We didn't delete them. So,a if we are not hyperactive now to just go for a new one, we will have a calm time to look into the suppliers who have previously, because every supplier we have their, we can say, commodity. What they are supplying for. So we can look into that.

But. What, okay. So you know exactly the ones that you currently use on a frequent basis. You know their quality, know their pricing, know everything about them. But what I am trying to understand, if you have 400 and let's just say, you are only actively using 100, you have 300 remaining that you don't even contact to find out about their pricing, their quality, their delivery time and they may even be able to give you a better price, a better delivery time, a better quality. When you are looking for, or seeking a new supplier or they're technically not new because they are already on your list. Do you even consider to look at them?

By practical, no.

No.

No. Because maybe we have forgotten them. By practical. Okay? But normally, if the active, we cannot find, of course we always look for a new one.

Okay. And then you seek it from that list.

Since it's a new system and thanks for your remind, we'll look there also. But basically and practically we'll look forward..

Just the ones that you have frequently…yeah.

We'll look forward. And sometimes, whenever they, during some discussion, some old staff, will sometime he'll remind, hey last time these guys did this before. Then we can easily take on to that counselors.

Okay. All right. So who is responsible for the decision making process? When you decide to choose your suppliers.

The sourcing room, we have a sourcing room. They will select. Not select, they will find a supplier, a new supplier whoever. They will fill in the forms and things, all that. I'll go through and have a discussion with the supplier. Then once I agreed, then a new system which I mentioned just now, even I cannot create a supplier. The account department, the finance department only can create a supplier in this system. So this is fully controlled. This control is good for the purchasing system because we have a lot of sensitive things, all right? So this is really a must, even if I can just clean the system then I can bring more of my friends to put in the system and then make them my supplier. So if the finance is control, then we need to go through all. Filling in the form is not simply to put in.

Okay. So in your opinion, what are the issues or problems with your current supplier selection process?

Usual in a selection. Selection..

It could also be within your existing ones as well.

Of course we, like hiring a new staff, immediately we cannot judge what's their strength and weakness. So this supplier maybe has this parts, so lets arrange them we pull them into the supplier list. But in the long term run, diligence provide any other some research. So it is like we are just depending on only one kit.

But technically, you are using ones that you are accustomed to, that you frequently use, that you know. So, as you just mentioned, that you're doing, like, if you take on a new supplier, if you are using one that was frequently used on your supplier list, you will have the problem of, you not having that relationship with them, so therefore its unpredictable. You don't know what they can, what services

they will bring to you. But from what I am understanding is that you are currently using the same ones, the same suppliers over and over again. So you know what are, if they have problems or if they have problems in delivery time, as you mentioned to me before. So you already are aware of what you have and what problems you already experienced.

Yeah. Currently, delivery will be always, always a surcharge. Delivery. Quality, because our, we are buying a raw material. So the quality is..we have it. The quality also, here means that the weariness of the material, the appearance of the material, so this is…but this is not to be critically a subject to discuss and immediately to reject. So quality and delivery, this is the main issue.

But as in, in the selection process, as in for instance, do you have difficulties in finding new suppliers or do you have difficulties with the accuracy of the information that you are given from the supplier. Coz I am trying to look at the selection process except not the material or not, coz obviously you are in manufacturing, you are going to have problems with delivery, you are going to have problems with pricing. But I am looking at more in process itself.

Talking to new suppliers, for individual suppliers, pricing always will be a concern. Quality, we cannot determine yet, the service without trying, unable to predict. First. So quality and delivery will be a later part but unless we cannot find these goods with the suppliers, we have to find only them. So we'll try to get the information on the parts and that's no difficulties. Pricing.

But is there any difficulty. Okay, let's just say, all right, you want to find a new supplier for something that you need to make. Is there any problem in accessing information to get this material? Or is there any issues that you have with a supplier to supplier, with supplier to buyer, supplier to buyer relationship? Do you find any problems? Taking away pricing, taking delivery time, coz that actually would be product itself. These problems that you are explaining to me as in delivery time, pricing and so on is after you have already taken on a new supplier. I am trying to understand if there is any problem that you are finding before they come on your supplier selection list.

Hmm. No.

So, maybe knowledge of what they do or finding, accessing them.

Because we are taking some common item, we call it.

We didn't go through any other things. Unless only one year. Sometimes there will be a trader. The trade we just met with a laptop, they sell, I can supply these and things so. So we just, we didn't go with genetrically. We just believe their price, we just look at the quotations and things and all. And then after, after we can find some issues, quality problem, any problem, okay. Can I come to your factory? Then we can, then we will find out. They got no factory, is buying from someone else.

Right. Has that happened before? That you did a site visit and there you found..

My premier is not here, my premier. So that is a lesson. So whenever supply comes, we will go and audit there.

So basically, it is inaccurate information.

Inaccurate. And the time that's framed, sometimes makers, okay its too late for us to go and audit there factory. Just give me the quotation, all right, issue a PO, deliver the goods tomorrow.

Hmm.

So the time limitation will, will stop us to go on a audit. So, but whenever we have quality issues and things and all, then what happens, then we find out that needs an audit, needs an audit. He didn't produce that, he is just buying from someone else and selling.

Oh. Do you make any purchases from alibaba?

I always go to alibaba and then take the reference, who is the supplier and then go direct.

And then go to them directly. So basically alibaba is way that you source.

Yeah. Alibaba can give some guideline, who's the supplier supplying to them.

So you just take the information of alibaba and you contact these suppliers directly. Fair enough. I have heard some very scary stories about alibaba. (both laugh). All right. So now we are going into the information technology part of it. All right. What are your thoughts on having information technology or business intelligence or artificial intelligence. Support for supplier selection. So in some companies, in my research had showed me that many companies in Malaysia, coz my research is concentrated in Malaysia manufacturing, I have interviewed a few companies previously where I, they are completely manual. They are not even using excel, databases or anything. So therefore, all of their information, they have to, when they are producing reports, purchase orders etc, its completely manual. So information technology, which is, you know, like computers or mobile applications or any internet source as well as business information tools, business intelligence tools like, I am probably sure that the programs that you are going to show me, excel, databases, all of these are considered to be business intelligence tools, enterprise resource planning tools as well. They are all classified as business intelligence. I am not expecting any artificial intelligence tools because that's what I am bringing to the table. So I am using past experiences, for decision making from past decision makers to assist and support supplier selection. So, do you feel that the supplier selection process has benefiting from using information technology and business intelligence tools?

Benefited?

Hmm. Coz without it, you would still be manual.

Yeah, of course information technology, not only for supplier celludite to supplier selection, information technology, of course the Google is one of the information technology for supplier selection, for source the supplier, its very important. Next, the dax mine tools.

Could I ask a question? You've mentioned that you are in this industry for 18 years. I am assuming that when you started, that there wasn't a lot of support from the internet.

Yeah.

How did you do it?

Do it?

How will you source? I guess yellow pages.

Okay. I came to industries to industries. Earlier I was in machine manufacturing industry. Machine manufacturing. Okay? So in machine manufacturing, we have electrical, electronic and mechanical parts. So electric and electronic, we will import directly from our, okay. So the machine was European made machines, so it was developed and introduced by an European from Netherlands. So they already have all their supply chains from Netherland itself. So they already transferred the technology to Malaysia. Only certain things we can do in Malaysia. That means, mechanical fabrication, you

know the CNC fabrication, you've heard of the water machine. We'll buy solid steel and then we'll cut according to.

Yeah

So we can do that in Malaysia. That will be. So the commodity, the main commodity would be fabrication and by-parts. By-parts means electric and electronics and fittings. So most of the by-parts, these, we buy from Europe, direct to the supplier.

So basically you didn't have any sourcing to do at that point of time. You have to created sources..

No. because we cannot get, because this all is custom made items. That means only a selected suppliers given a contract, given a R&D fund for them to develop these and give to the manufacturer of the machine. In Europe, they have done that. So why they started technology transfer to Malaysia, in order to go on ways this effort which dated many years ago. So we go and buy from them directly. Of course, buying from Europe is expensive. Expensive of causing term of currency selecting, regarding service charges and things. Come back to your question. So machining, yeah? So machining, we widely, of course, now if you just put on Google, you can see 100, 200, 300 suppliers in the list. But earlier, we have yellow pages and then network from people.

Yeah. All right. And do you think that it helps with your decision making? Like, use of information technology.

Yeah. Helps a lot. Speed.

Speed.

Speed.

Access to information.

Information, speed and things on WhatsApp, because..

You use WhatsApp as well?

Yes. We use WhatsApp, we use Skype. (laughs) we use WhatsApp, we use your Skype, we use E-mail, use internet, use KakaoTalk.

What? What is that last one?

KakaoTalk is most, okay. WhatsApp is well known world wide. But some Japanese and Korean, they don't want to touch this WhatsApp. They all like to go to KakaoTalk.

In Malaysia, its WhatsApp, I mean in Taiwan, its using Line, and China is using We Chat. So every country have a different, this type of…

World view IP.

Yeah. See in this information technology, there is also the speed. Those we are carrying a hard copy, time to check this, spelling check, and means all these things. Then I am go and give to another guy, I have to go and give to him.

So can I ask how do you use WhatsApp?

How do i…

I know you use WhatsApp obviously but, how do you use it with suppliers.

Okay, yeah. Okay. See then. I need to look at it and then may be I have a picture, then I have to go and see, hello I am calling, and then they used to be there, or I'll come or you'll see that, a few meetings is lost. We just because we are sitting just nearby, a few meetings is lost. But in WhatsApp, I don't need to go and look for anything. I just take the picture, pop, send to him, did you know this item?

Does that compromise security for you?

Yeah. No problem. No. You see the supplier, I am sourcing something, all right?

Yeah.

Okay, though I have to compare to those days and now, I have to call him, hey did you have this, did you have, what is that? All the dimensions, we had to talk a lot. Worst case, we just can draw a drawing and fax to him. That also is not clear. So now take the picture and send to him now.

But does that comply with your ISO?

No. because, we, ISO, sourcing, sourcing because technology is changing and then speed. We need to cope to the speed. I cannot wait because of my ISO didn't allot me to take pictures. I cannot wait for that. All right, we just need to picture and send to me. Then I say, okay, looks like fine. Okay, then I can send to the whole group, who's making decisions. Hey guys, please check, is this the one you are looking for? Few second, the guys will tell us that's the one, please order. So, getting this information from the supplier and we'll review, making decision within a few minutes. And the PO can go out.

Okay, so when you are using WhatsApp with your supplier, does that mean that you already have their contact number before.

Yeah.

Okay. Coz I am actually thinking if there was, coz I have done work with the federation of Malaysia manufacturing before.

I think you have a good question. I keep on my WhatsApp, a group of engineering people inside all my friend list. From LT metals, from the tanks from Wal Metals, and all the MRs. And then my friends from Apple, Intel, all inside the group of project. So, once they see we cannot find something, they will, type, I need to find this part, tttttt….or any some priority like method.

So that one is still technically with of most. Its model networking as you still, you're still asking people. But I am very intrigued by the use of WhatsApp because other people that I have interviewed before, they are using WhatsApp as well. I find it very interesting that, because obviously it is a supplier that you have made contact with before. But is it anything that you are using with new suppliers that you have just met someone that you are intended to probably, maybe in future do business with.

Yeah. Because, why, I just had a, like for an example, I am going to meet a supplier. He was doing business with us but not active and then my senior buyers lapsed. So I get from the system his contact, okay? I call him, then they say that, we are busy, we are busy with E-mail, WhatsApp, call, E-mail and things and all. We've got no time to answer the call every time. All right? So we just check, what time will you be there tomorrow, okay. I am available, so, chop, chop, chop, chop, we'll be out in a few seconds. Rather than I need to call you and direct talk, they will be busy. So sometimes, they are not able to, so this. Even though it's a new supplier, WhatsApp is helping. Just now only a few minutes ago before you come, we are changing a appointment time and things and all, so we

WhatsApp. Because the time whenever we are very busy with all internal activities, a lot of issues, so a limitation of human beings, firstly trying to call. So we will look at it, who's this guy? But whenever it comes as a message, it will stay in the inbox. So we can look into it and then we can answer him later.

I see.

And fast. We've got E-mail of course, in the Inbox, in our server, of course we can carry, but certain unofficial communication, unofficial communication, as a chat. We can do here, Skype and WhatsApp.

Coz I mean, how I view WhatsApp, its very insecure. Its insecure system and it can be hacked easily. You walk down the street, you lose your phone, and you have prominent information in your WhatsApp which could be accessed by anyone. I could even, when I am here, I am using, coz I live in London, I can even have a Malaysian sim card in my mobile and I can still access my London WhatsApp. And if it is restored and backed up, I can also access this information even though, I am still here and I am on a different phone number. Which would also be the case with anyone else. You can walk down the street, you could put in a new sim-card, once you knew the old phone number, which you can get. It just seems to be a very, you know, not secure way for me to see how you do communications.

Unless we do some confidential things, then we worry about a lot.

Yes. Tell me like, think about this, like if you are taking a picture of like a design for instance. Is It like, do you have like, pictures as you write ready to be sent as message, you send message differently and then you are going to take a picture of this. This your flowchart. Your ISO approved, flowchart. You take a photo of it, just for instance, as an example, on your WhatsApp, it stays, not only in your WhatsApp but also in your photography gallery. That's it if you have that settings stated. So let's just say, take aside WhatsApp for a second and you have it in your photo gallery. Walk down the street, you accidentally lose your phone. All of this information which is confidential, is lost. So, for me…

Whenever, okay, this is just a communication for exchange the new, not to say photo and things also, this is in hard copy and then we have in the server. And then this is a controlled document or not? Whenever it's printed out, printed out..

Yeah but that's, that's why I mean think about someone, let's just say some other company or some other rendezvous or someone gets their hands on it, they will know what is your process. And I am stating that this is a confidential document. So for me, it just seems to be unsecure means.

If res is very high confidential, we will not use those.

Okay. All right. Okay, so can you tell me, what is the names of the ICT or PI tools that are used to support your supplier selection making.

ICT?

Information Technology. So what is your systems that you are using now. What is the names of it. B, what is the accounting one?

Oh. Okay. You want to do..

I can introduce a fast introduction. (they laugh) What's the name of it? The accounting one?

Autocom.

Autocom.

Autocom, counts, ..counts.

Auto, auto-com.

I recognize that only 1% in Malaysia, I know, is not using WhatsApp. (they laugh). We don't need it. I don't even know him.

Yes, that I also know…(laughs)

See. You cannot run away from technology.

Of course.

Even the people who, who don't know how to use the touch screen, they are laughed out. And then they look are looking at people, you are sharing a photo? Pppp…few seconds, that's interesting. They are looking at the internet and think, so-so and this guy, even they don't know how to read. Then they started using touch screen.

I know one of those people. (laugh) I think we had it for 5 minutes, he downloaded WhatsApp for 5 minutes and then someone messaged him and he's like I don't want this anymore, delete it.

Know what, again, any technology makes you more tired. Earlier, okay maybe you are not in that generation. While there was E-mail, we were, fantastic, this E-mail. We're waiting any E-mail will come on our, or maybe per day will come one mail. All right? What we received. But our post box will be full of letters. Okay. So nowdays, its changed.

When we used to use our fax, we only used to get one fax and we were so excited to hear the fax. (they laugh)

I remember when my ex-company per day I will receive probably around 300 E-mails at least.

So, you see the difference. Why are they looking at our inbox, those days, when E-mails were exciting. E-mails, but our mail box will be, our house mail box will be full and filled up in old days. Nowadays, the technology is changing. The mail box here is full and then our house mail box, is only one letter. So we are excited to get..

Excited for the letter.

Technology problem here. PC, enter.

Yeah, but did you change it here?

What is this?

Computer, PC.

Yeah, but did you change it here? All the things,

Oh. This is two different computers. This is operated, this is a big computer.

Very big.

Its easy for discussion.

Yeah. But is it a touch display?

Yes. Touch screen. It's a touch screen. This one is the top builder. Touch screen, but I have covered it with a thin glass cover. This is called builder. This is not TV. So, yesterday I changed the settings. So now you, signal is start the computer.

But it is started, it's on. It was fine. I don't disturb something.

Off and on it.

Lets keep the speech.

All right, on.

Talking about your old problems.

I messed up that.

Even though we are little bit older, we are up to the technology. What, where you are using, we are using. WhatsApp, Skype and things and all. Even today morning, I scolded a colleague, can you install a Skype? Because you see, again, while we are checking our E-mail, the Skype would pop up, and then we can reply them fast. Technology. So otherwise, even though WhatsApp is beginning to take up for my pockets and answers, time is lost. That's true. Whenever you are to expose these kind of things, then you are frosting.

I am using, its on my Facebook.

I can…

I started Facebook pretty late. I think in 2009.

I used my first iPhone in 2007. Then I got iPhone 3G.

Aah..I had the one with the 2. You know the 2G? I had that one.

And you are talking about technology, I have difficulty to have, get up people, so I posted on my Facebook, I wanna buy and I wanna store people.

Does MSM have a Facebook page?

No, no, no. my own, my..

No, but does MSM have one?

No. MSM don't have.

Why?

I got nothing to update on.

But you look for suppliers on Facebook.

Not really on Facebook.

LinkedIn?

LinkedIn…LinkedIn we put our own personal things sometimes. The suppliers I have within the contact.

Hmm.

Okay. Let the dice wait, use a small wine. Okay, this is what I tell you about Auto Com. This is, what I heard, this is a Malaysian software but is good enough. So we used the SAP earlier before. Not here. SAP is too advanced. Too advanced. SAP.

Yeah, I know it.

Its too advanced.

May I ask why?

Aah..certain industries, my previous industries, we used, so..have you heard about the Sight Line, its an American program.

Yes.

Used Sight Line, that's good enough for it. But after we go and migrate to SAP, its too details in and then a lot of, but advantage, good for company. Good for the company, means, still remember I tell you a material, we buy a material and then it will, planning will their plan. Okay? Production plan. So whenever they already changed the production plan, the system will pop a message to you, this material, don't push out. So we have a lot of tough times. Thousand lines to push out, don't deliver, suddenly a planning or a customer will, okay tomorrow I'll change. Then the message will be 'pull in'. So it's a wonderful system for the company.

So, this Auto Count, is it a database? What exactly is it?

Okay. This is linked in between finance, accounting, purchase. All right?

That is one of my questions. Yeah. So finance, accounting,

Accounting, purchasing.

Okay.

Sorry, otherwise we can do it a nice big screen.

No worries. So, three departments, are being, are linked together with software.

By rank, if it is a MRV then it will be linked to the HR, production all the billing but this is the only.

But this history. So…all right so we made…

Okay. For me first its suppliers so this is a list of suppliers in it. All right, this is the number of suppliers, 475 suppliers.

So you get company name..

Render coach,

Could I have a print screen of that?

You want a..

Just only fields that you are using.

You want to print it out all?

Just this. You know print screen. You know you can print the screen?

Then send to you?

Yeah.

How will we send to you?

You can E-mail.

All right.

I do not have WhatsApp in Malaysia.

But you can receive WhatsApp from any country.

Yeah but I didn't install it. Okay. So it's F, farlon.rehman@my.westminster.ac.uk

Okay. Great.

Excellent. So that will be the type of detail that you store.

Okay.

Hmm. So how is this, so do you get your purchase order and stuff done, when do you started..

Oh, sorry, sorry, sorry, sorry, sorry. I think I sent you the purchase order. There is no any sign to print I assume. I just saw these kids just now.

Mmm.

Try to..this is the outbox. Aah..we got inbox.

Heyyy..

Gotta use that. I will like to use this. Too small. So when we are growing big, we don't appreciate whatever we have.

Small dump.

On greed based Star Wars.

He didn't have some box inside that. He laid the way down.

So, who inputs information into Auto Count?

Okay. Information, what kind of information we need to put here at is supplier, a new supplier selection. So we will need to go through the ISO configuration, things and all. And once I signature, the accounting, finance will, put it there.

Open the account for them.

That's for supplier. Any new item, new item, so I can create. Only my password is allowed to create. Manager's password. So the purchasers are not allowed to create any new partner.

Do you allow it to just some men who are just currently filled.

Existing. Whichever..

Existing.

Okay. We will need to have in detail. So it will take up what, 15 minutes to explain.

Okay. Are there always stuff written…also it is a Malaysian company.

Yes. I am very sure they copied that from somebody because its too..

I think that Malaysia is on looking for numbers and…

And my biggest company, they are fully direct. They have all MRV system just for this process. But never is very good. No. This is very good income. Even I lose the SAP before. What I think is just nice for this company. We need to utilize any system like it's a 100% Israeli, but how, are you using 100%. No. mostly people will just use about 40%.

Yeah, 40% of it. Yeah.

All right. So 80 is a great, greater. Greater means it is a supplier. We have totally about 480 suppliers in our list. So this is a…

So this one, could I have a print screen of this one? To see how, just to, I just wanna look at the interface. I will look at the interface.

Do you ask me to send to you?

OUR. You can print screen and copy there and then I'll send to you.

Okay, that's fine.

Okay.

3M. I tried to send questioning to 3M deliveries for them to meet.

3M. 3M supplier? Yeah. The lazy guys. They are our supplier also. They are one of the supplier which I already, even I look at them, they are calling.

But isn't 3M an international company?

Even you can spoil a BMW's name if you don't know how to drive. True or not? Mr. Mercedes?

Mr. Mercedes.

I think we are right. We have a very practical desk. I spent a lot of time to…

Has it done?

This or that?

Paste, no paste? No that thing will paste.

Okay because the copy screen is need to be in PDF. I need to convert to PDF. Ah, fork. So see the time is not a lot, so the next time you just need to write that is doing for me like this.

I don't think he copied anything.

Yeah. That's old functioned. Too many peoples. Okay?

Yes.

All right. So…save this as..inside folder….and by number, is it here,  all right, the supplier list?

Yes.

Okay. There it is.

Great.

Thanks. So this is supplier list. In order to raise PO, we need supplier. Then we need to have stock items. Stock item means one of the things that which we go to buy. So we need to, every item has its own code, its own description. And then, we call under commodity, a group. We need to, because why we need to create a group is because whenever we buy, end of month, the finance will be calculated. Okay so this item buy for IT use. IT for production. So this is aligned internally then we name it as group, what group it is. All right? And then shelf is a number for stock count. Some item, not everything we use is stock controlled. So we have, which ever item is stock controlled, we tick it. Right? So, second is, is it active or not. Some items, will be deactivated because its not in use, in greater time. So totally we have about 475….

So is this the when you sell it, to use your system coz all of them agreed to value same date?

Yeah. It was in Excel, so we uploaded it. So Excel anybody can create and keep and then they keep doing whatever thing they are liking. But..

So is this compatible with Excel? So you can import from Excel easily?

Yeah. Yeah, copy and all. So once we already put into system, nobody can create their own part number. So they need to come, I want to buy this item. Okay. From which supplier? This, this, this. Okay. What is this number? Okay, this, we need to, because we need to give some common part number which we can recall in future. Because we are not using, we are not a Orion maker. Orion maker, they have their own part list, always use the same thing. So we can refer from the designing bound list and we can take back. But our system, project term, sometimes whenever we already do some project, then after 2-3 years, we will want to use it back. So some common sense we need to use a basic to recall the part number. Its easy to find. So that's why we need to create it. So this is a part description and things and all. And this is our purchase orders. Okay?

So all of them looks the same. All of you're the different screens they look the same.

Yeah. All the same. Its not like…

Could I see what a purchase order looks like?

Yeah. Okay, this is a purchase order. So, this is purchase order not purchase order likes, all right? So everyday, as a manager we need to go through how much purchased, who is the supplier to purchase I just can, can just put a describe today. Okay. What are the purchase orders created today? Oh yesterday. So until now they didn't look yet. So yesterday they only created about 33600, and these are the suppliers and things and all. Okay? And then we have GRS there. You see, yesterday they created, yesterday it was to be delivered. So urgent. So yesterday already about 20 PO must been issued out in the belly of this and who is the supplier, who is the creator. PR01 is creator code. Like this.

Okay, purchasing.

So you want to see the purchase order, for example, losing few seconds?

I don't think you have anything to improvise.

Okay. So, heading, the supplier, contact and thing. This is the code, item code, description and tax. We also now mention something, GST.

GST, yeah.

Its PO, date, delivery date fallen, terms, payment terms.  All right? This is the, my receipt of urgent. So always, so then after they have picked up and thing and all, they will come for signature to me. And what's the security added over here is, every PO they can print out only once.

Oh. So if you have to print out another one, in any error?

Security. You will not know what is the security, maybe once you'll be at the manager's position then you'll, why we need to control only one time.

I think I have a fair idea why.

Okay? So basically this is the purchase and the purchase order must not be shown to you. So you want to see the purchase order screenshot or what?

Yes, please.

Particular, or…

It doesn't matter. I just want the screen, just what it looks like. Yeah.

This screen?

So the auditing process for this, how does that work? How do you audit your database? I mean I know that you are just implementing…

That's the order there.

Okay.

Why don't we just put everything over here and finally be safe.

Oh yeah.

I rename it to PO, all right?

Hmm..

And this is a supplier. All right?

Yeah.

So, okay. So you'll, otherwise you'll have to..

As we are here actually, I mentioned before that I would like to access 3 or 4 past decisions that would be on new suppliers. Is that something that you can extract from the system?

No. we cannot. Because selection of new suppliers is based on hard copies.

Okay.

But I have an idea. I am going to change the procedure. Whereby, if anything in this list, because yesterday the auditor asked me, okay? same question almost. Now you would have dumped 400 suppliers signed here. Foreign supplier. But they have a hard copy which is they have at least approved by General Manager, about 200 suppliers. Then you say, this is approved 200 and now you have 400; so this gives me an idea. Yeah. I need to do a cleanup first and then I need to change the

procedure whatever in the system is considered approved supplier. Because it goes through selection, I cannot create, they cannot create. Only…

Accounting.

Accounting. So this is controlled.

But how do you audit it? How is this, okay, so you've implemented in January. 21st of January. Yeah? So it's a relatively new system. How are going to audit it? To ensure, auditing is to make sure that your information is correct. You know when..

Auditing the supplier again.

Yeah. How do you audit it?

So, as I mentioned just now, we will first, we will select the revenue. How much, okay? So I need to run, total. So maybe in enough this year. Maybe this year I am gonna keep the auditing because we implemented a new system, I don't have the full data over here. So early statically manual and then all this scribed. All right? They are true. Because whenever we are doing in Excel, whenever we are doing in Excel, we can alter all the information.

Of course. And in that way, your information has standard chance to be incorrect because, I guess you just leave your computer open and you leave the database and you accidentally touch it, you delete something. So, in this case here, let's just say, you are going through an auditing process, okay? You'll look at the creditor name and your case here.

Yes. How much okay. For example, very simple. Just give me one name of a product. Let's say I, okay, Pallapong amorph is highly used for treatment. As just now, tttttt….All right, this guy. Since the day 1, I really implement this system, to today, they only need about 50000. Sorry, we have to show this allowance because your are a special customer to us. Otherwise we will not show to anyone. Always its closed.

Yeah.

So, 50000. All right. So maybe in next few more months, they will come above 20-30 lakhs.

No, but you are talking about here. This is your evaluation process for the suppliers coz I remember you already explained to me how you evaluate by amount.

Oh, okay.

So this is what you are talking about. I am talking about going back to the overall supplier selection list. Yeah? How are you going to ensure, because you have creditor name, you have phone number, fax. You have the person to contact which is under attention. How do you, because what you are talking about just now is evaluation of your supplier.

Reevaluation? Okay.

Reevaluation. Coz that's what you do. You do it on a yearly basis of your suppliers. So in this case here, you have the entire database here as well. Each one of them, you are gonna go through on a yearly basis and evaluate them by amount. Right?

Hmm..amount.

But how do you ensure, this list here, as in of 400 people, suppliers on this list, that this information here is correct.

This information is correct?

Yeah. Let's just say, okay, take for instance, Miss Chung under the attention, yeah?

Oh, Sorite D'Mello, that is not a PO, this is creator. Okay.

Yeah. Let's just say.

Please go on.

Okay. Let's just say, take the E-mail address for instance. How do you know that that information is correct and if it has changed, how would you know it has changed?

Okay. Good question. Okay. Whenever we are doing migration, system migration, we will just copy and get it done, all the alter time program. We still pending in the organization data cleaner. Okay. I, my writer is supposed to do that. Data cleanup, in terms of supplier's information, cleanup stock items, just now I have shown. Even though I already have about 2000 items over here, 4000. Maybe actively used is just 2000. So I need to do a cleanup. So I am pending this activity. So, because of the lack of staff, I need to do that by this year. So whenever, so go back to the question again, why I am doing this. So I need to divide for my girls, okay you do 50. Check, correct name, correct that. This is to be correct. All right? Whether they are supplying a receipt? Phone number is correct. So the data cleanup need to be done.

But if it is, they commit, make any changes in the system already when they are changing?

No. Whenever I'll assign to them, okay, this can be print out into Excel.

Okay. And they just write there.

No. They will go and survey first. Check everything. So whenever they want to change, I'll open the screen for them. I'll put my password. Okay you do the amendment now. After they are done, finished.

So although accounting opens each case file, well each file for each supplier, they'll not be responsible for changing that either, would they? If they open it, could they change it as well?

Ah, we need to trust sometimes. (they laugh).

Because, look, the case in point, you have the address, sometimes also when you have data migration from Excel to here, sometimes your data is duplicated, or sometimes it didn't actually copy over. You know, these are things that I think are..

There are two scenarios. Either typo error. Second thing is a fraud. But, depends.

Coz one of the issues that I have uncovered while looking at the supplier selection information is that the data is unclean. Which is, when you migrate from one system to another, your data in unclean. And sometimes you have replications, sometimes your data is incorrect and you are running on your human ability or foundation. Coz your supplier selection list is your foundation for your business and the information is incorrect. So what I am asking is, are you going to, coz your system is pretty new, are you going to? How many types of processes in future whereby you're going to make it an auditing process? Maybe every 3 months, maybe every 6 months. Especially to the suppliers that is inactive. Because your active suppliers, which are ones, let's just say 10, that you are using all of the ten.

Obviously the information is going to be active. Coz if they are changed, obviously you have a close relationship with who you speak. So you are to know, let's just say, the person that you deal with, your contact person has changed. So you can physically change this information like that. But if you have an inactive bunch of over 200 suppliers, how would you know that that information is active. I mean, is correct.

That's quite difficult also. Every system have some limits.

Of course.

And even to do this exercise as a cleanup also not I can do. I can review and then ask my men to do. So as you mentioned, you are right. Some not active supplier, which they feel that I want to have, make effective, while using my password they can make it like this. Right?

Coz look in these cases here where you have no E-mail address, whatsoever.

Yeah. There data cleanup need to be done.

Yeah. And maybe you could also input web page address. Is there, are you allowed to add fields into it? Because the reason why I was thinking about you can insert, you have your website. Let's just say for instance, you have a new supplier for, you need a new product and this suppliers are already on your supplier selection list. Do you think that they maybe able to provide you with a product that you need for a new product. That you are actually, you know, going to make. You could just, have a link here, we can just click on to your website instead of having to type it. Everything is interlinked. So if you put any website, it will give your hyperlink. It will send you straight to your website. You can even put it specifically to services or products provided. So you don't have to go to the home page. So you just make it easier.

Yeah.

Yeah, so back to my question. That was the auditing process. So you are going to conduct some sort of auditing eventually on the database.

That's what I call data cleanup.

Data cleanup.

Data cleanup for the supplier and also the item. Data cleanup any system storage, any system, every, we need to do a basic cleanup is a supplier and stock items. Second thing is, second thing is, the PO. Even we are creating a PO everyday sometimes you can be see a carvation that I have received is cancelled but no remarks. So I need to do a critical check on why this is cancelled. Because I already, adequate to any cancellation, you need to put a remark on this. So this also and ongoing, need to, critically we need to something and all.

So seeing that you have implemented this system in January. Was there any problems that you have experienced with the system? And your supplier selection process? Did you also train your staff in using this?

Supplier selection process, we didn't use this system. Selection process, not.

But in the implementing, so you didn't use this selection at all. Coz you just actually migrating from your hard copies as well.

Selection is, a new supplier, so whenever we're selecting a new supplier, we know only, nothing is related to the system because searching on the internet, and then we need to get all their details, and then we are putting them into a system is only a process.

But do you have your experience, any problems, with this system since implementation?

Problem, yeah. I, because it's still new, as I mentioned, any system maybe, as for now I can tell maybe the usage, the usage of total features is maybe about 30%, 40%.

So you need training basically. Do you, does, Auto, what is it,

Count.

Auto Count, do they training?

They provide but a very basic. Then we search up by…

Because this is very similar to how Excel looks and how Excel operates but in a more simplistic form. So maybe you don't really need much support from them. I think probably, that's what they were going for. That, it looks just like a spreadsheet. It has the same functions as the top as a spreadsheet. Then at the top, under report, on the heading, does that generate reports for you?

Yeah. We have a, we do a lot of reports. Okay. I can show you, like earlier, they will use Excel at least to generate report and then they have to, almost of a half of way, they need to place and turn to generate report by the Excel. Some accuracy, inaccuracy. So with this system, you just can report, generate a report with just in a click.

And what type of information do you use on your report writing? What do you need for your reports?

Every week, we'll do a chasing report. Every Friday. Every Friday at 8:15 morning, we'll do our purchasing report. So we already used the system and this is the report. So by the use of a work week here, we use a work week. This is probably one, I think we need 23. Last week was 23. So generate a report. Okay. One of the report we are using over here is ok. Like purchasing a new souvenir for jewelry. How much total PO we issued, how much total blanket PO is not originally in that. Then, received. Total received cookies, received. Total issued. Issued means, we issued to a production. Okay? So this is the total. So for a month we'll have 4 weeks so it will be a fair accumulation of it. So we have limit. Okay? This limit is based on 35-40% of the sales figure of that particular company. So we shouldn't, but 4 weeks of this purchase shouldn't exceed that limit. If we exceed the limit that means we are already going off that, unless the sales is increased. So this all guidelines. And this is category. Category means this category for finance purpose. Just now I mentioned to you.

Yeah, yeah, yeah. I saw it.

So much out keeping of factory. So this month for out keeping our factory, we spent a lot.

So it will be like maintenance.

Yeah, maintenance. Raw materials, sub-contractor charges, packing, and all the things. So, all right? This is a, the supplier, by supplier which is the top ten supplier. So number one. We paid 98000. So this is my top ten.

So if this is your top ten, this means that these are the usual top ten that you are..

No.

No.

The particular, particular week, month or this particular month top ten. They will be changed then if next week issued someone more PO, then they will change place. But all this is generated from the system directly and active. And this is our open PO. Over open PO is whichever PO is still open and not delivered. So this is important for purchasing. Its vital activity. So we always need to make sure that all previous POs need to be closed and …

But this wouldn't give you the names of the ones that are currently open?

Yeah. If I go here, January, so, sorry. January that I know this has got 9000, 4900. So I can go to the system. Its easy. Just go to the system. Purchase order, we can see the deliveries order. We can go in detail, this is PO. We can go into the purchase order detail. Aligns, individuals aligns. All right?

Can't you filter these?

Yeah. We filter and then which are the deliveries open since, earlier this week, last week. Earlier this week, not today. So we've about 72 lines. So what is the value? See.

4000 something, 492.

This is not right. 73000 still open.

But you know, like in Excel where you are able to go where you talk like. Just in case, just you were looking for a price right? And you know in Excel they have a drop box that you can search just only for that price in it. It'll bring up that line for you. Could you do with that?

I think so I don't understand.

You know in Excel, like you were searching for a particular, like in this case we are searching for 492, that amount. Right? For the purchase order. You know that where, coz I am assuming that it would be under total right?

Yeah.

You know in Excel, you could have, there was a drop exactly, like, you could have exactly, you could just search for it right there.

Hmm-hmm.

So the 49011 here..

Yeah, okay?

And that would just, okay, so that'll bring it up. I just wanted to know if, how similar it is to Excel.

This is quite simple. And I am happy with this system. If we're stable with system, because, whether the nothing, we need the basic.

Yeah.

The basic. Sometimes whenever we progress, then we forget our basic. Basic is very important. And for this company, this is good enough.

Okay. So the only difference, to this than Excel is that you are able to integrate all different functions like finance, accounting and purchasing and you are able to do, to manage your stock. In a more

automated way. Look at your, you inventory and you can do reports. Which is, you couldn't do that with Excel coz in Excel you have to import the information to..

Excel is something you keep in like in there. And then, okay, now maybe for some, we go to the typical way. The girls create an Excel PO but this Excel PO will not be linked to the final Excel PO.

Exactly.

So this system is linked.

So this means…

Auto Count, the database have a central data,

Central data to link together.

So everyone is like,..

A bit, maybe is semi MRP.

Can access it from your phone?

No. Cannot.

What can you can't do?

That can't be done you see. Like I was saying, SAP. SAP, we no need to signature to PO. Because whenever they start to generate the PO, the system will not allow them to print. Even not print. Now they can bring to print to me for signature. SAP will not allow them to print. Whenever they already done, it will come to my workbench, so I need to open my workbench every time, so waiting PO. So I can click to see the details, all right? Approve and it will go back to them, they can print. Right? Their system, they have ads, in iPhone, where whenever the manager or things are ready to go out, they have ads. So we can do the same thing to approve the PO. SAP.

Ah, that was my last question actually coz you mentioned that your only problem that you have is just data usage and data cleaning up. You are already sending me the type of details that you store in your database. You mentioned to me about the auditing process which will be done later on. That was actually my last question. So, that was very interesting.

Aah..thank you.

I liked your system. It's really simple.

Simple? Simple is the best.

And that the fact that it is also interlinked with different departments. But could you view that? Like could you view finance, or is it, you can't view it?

No, I cannot go to the accounts.

Okay.

And also you see that, whenever purchase we will do a good dressing. So every good dressing, we will have, they can receive the PO. Okay? They receive that particular PO, they will close that PO by the system. So, I can view from somewhere else, is this parts delivered or not. So this is good. Simple and straightforward.

Hmm.

Different departments have different authority over Auto Count and CFO have a full authority.

Full authority.

CFO, CO have a full authority. But we right now can access purchasing order.

I am quite hoping with this because we have just implemented about three months ago, everything. So the main, the first thing is whenever you have system, you must trust the system. Second thing is training.

Definitely.

We train and then make them understand, okay? And then, elimination of Excel list.

Did this come with user manuals?

No. they didn't provide. We had to learn ourselves. And the good thing is that we can call the call center. So we have to keep call for whole day almost and then..

Well we just started implementing that year at the beginning, we suffer and all the girl's company, but right now after they used to meet, then they started loving.

We introduce by, we didn't introduce to the old statemen. We start here first. And then, I take charge for the purchasing. So I set up a small group. So we start to learn and introducing all that and then learning. A small group learning, we flavourise. We start and use it, okay? Next month, we go there and train the whole group. Start using and then go to. So keep improving. Any improvement I saw, then I'll share with the group. So right now, I

So kind of like, testing it in a way.

Not testing, but hands-on. Hands-on and then suddenly somebody, hey this is better. Can you try to get to that. But of course the training, or the basic training from the designer.

Okay. All right.

So we'll have a weekly report. We have a system. We'll do a monthly stock count. Okay?

Okay, so you've print screen for me, the supplier list?

Okay, the supplier list. Okay. Supplier, this..

The purchase order.

What else you want?

Could I have a copy of this actually?

You can.

And what else this one, what is this?

## Case D

FR: could you tell me a little bit about the company?

INTERVIEWEE: We are 10 years old. We started off as a purely consultation company which was a one man show at that point.

FR: Consultation in which area?

INTERVIEWEE: Project management. So it was a one-man show and I was the one. So what we did was, we designed and built a machine from scratch. It is a PET. So PET bottles are like coca cola bottles so among that two of those machines that are qualified for coca cola bottles, one is cedel, it is a French made machine and other one is chromas, a German made machine. So my client they actually were in Malaysia for 10 years, however similar like you, they had problem with supply chain, so they had over 70% of parts that they still import globally. Local contacts are only 10%. So kind of monthly speaking is not viable for them to manufacture in Malaysia. So the French director says, now since we are here for 10 years, why can't we design a machine. We manage to finish the project within short months in the allocated budget. The deadline was very finite because the moment we finish the machine, we would have to send it for an exhibition in Germany. So there is no delay or no extension what's so ever allowable. So we finish on time and we finish it below the budget. So we sent to the exhibition Germany. And they sold 25 machines on the exhibition so it was a big success. The French director was so happy he had signed me up for a second contract. It was to localize their French design. I was very happy. Life was good. Then they decided to move to Beijing. They invited me to go to Beijing as well, but Beijing was never my cup of tea, so I decided to stay back. So I started to get a little more hands on. We started to design malls, fixtures, small machineries and also assembly. Now today our core competency is actually design, contract manufacturing, fabrication and also our engineering services.

FR: How many employees do you have?

INTERVIEWEE: It is more than 4.

FR: Ok. What countries does your company do business with currently?

INTERVIEWEE: All physically located in Malaysia but the origin of their mother company mainly from Europe which is France, Germany, Americans and that's about it. We don't deal with Dutch anymore.

FR: So moving on to the supplier selection process. In much detail as possible, can you explain to me your supplier selection process?

INTERVIEWEE: First of all, we are ISO certified company. So we do have a set of procedure on the qualification of our vendor. So we do visit our vendor to ensure what kind of service and product they supply to us they actually have competency of doing it themself. Of course we also have trading suppliers. So we categorize our vendors differently. So the selection will be different. So if it our subcontractor we definitely must ensure that they do have the machinery or necessary equipment's to manufacture the parts that we purchased from them. Not only that they must have the quality equipment to actually ensure the quality of the products they deliver to us. I think those are the key points.

FR: You mentioned previously that the companies that you do business with Malaysia, Europe and America. How did you source? How did you go about? How did they find you?

INTERVIEWEE: Most of my customers are introduced by my customers well up north. So this guy introduced to another guy and so and so forth and with a lot of years we just had them.

FR : Besides word of mouth, do you use? How do you?

INTERVIEWEE: Do you mean the internet? The advertisements and so forth.

FR: ok the internet adverts. What type of adverts?

INTERVIEWEE: We do not have we have any internet advertisements for the time being. We only have our web page. Recently we have joined few societies.

FR: May I ask which ones?

INTERVIEWEE: Malaysia Automation Technology Association and those land us a few jobs as well. Actually last year we were appointed one of the three Malaysian consultants to actually revamp the Malaysian timber council. As a representative of the Malaysian timber council to revamp the timber industry in Malaysia.

FR: Are you a member of Federation of Malaysian Manufacturers as well?

INTERVIEWEE: FMM? No. The FMM is the mother company of the Malaysia Automation Technology Association

FR: MATA?

INTERVIEWEE: Yea. We are part of MATA.

FR: Do you use any applications? mobile applications?

INTERVIEWEE: Such as? Of course we do

FR: For your suppliers or supplier selection, or anything like that. To source your suppliers?

INTERVIEWEE: No. you mean beside Google?

FR: Besides Google.

INTERVIEWEE: No. we don't even use Ali Baba.

FR: But sometimes on Google, the information isn't always correct.

FR: So could you explain to me what are your most pertinent supplier selection criteria?

INTERVIEWEE: Cost, quality, service.

FR: I'm assuming technical ability will be one of them. Because if you are allegedly a small fabrication design and you do engineering, if someone is coming to you, they would approach you with a particular project for you to manufacture for them, yes?

INTERVIEWEE: If they don't even have the necessary technical We don't even consider them around so we don't even ask them to give us a call so we wouldn't know the cost, we wouldn't know their quality as well. We wouldn't try them so we wouldn't know their services as well.

FR: So how do you evaluate your suppliers then, because you have a vendor list yes? And they are approved to be on your vendor list. What is the evaluation process for your suppliers. So you don't have a site visit or you don't have like a form that you give to them to find out their financial stability, one of your characteristics.

INTERVIEWEE: No

FR: So just generally site visit and ISO certification and quality and service?

INTERVIEWEE: We don't even need them to be ISO certified.

FR: ok. So you have a particular group, can you explain to me how your vendor list looks, you mentioned before you have a separate list for trading suppliers.

INTERVIEWEE: Well we basically categorize them in four.

FR: Do you mind telling me, how many suppliers on an average are there on your vendor list.

INTERVIEWEE: I have no idea….30….

FR: And who is responsible for decision making in selecting suppliers?

INTERVIEWEE: At this moment of time. the operation manager and also I have a machinery specialists as well and also I have production executive. They are taking care of different division. So they are taking care of different suppliers as well. Depending on the nature of the suppliers each of them is taking care of decision making of different set of suppliers.

FR: On average, how many categories are there for your suppliers?

INTERVIEWEE: What do you mean?

FR: You mentioned before categories and you mentioned before that different people are responsible for choosing the different types of categories. How many categories you have on an average? A number on top of your head

INTERVIEWEE: Let's see.5 or 6

FR: In your opinion are there any issues or problems that you have with your supplier selection process?

INTERVIEWEE: Yes. obviously

FR: What types of problems are they?

INTERVIEWEE: False advertisement.

FR: Do you encounter that often?

INTERVIEWEE: I think that's part and parcel of manufacturing

FR: Can you give me an example of false advertisement.

INTERVIEWEE: well there is nothing they can do.

FR: And you source this from Google?

INTERVIEWEE: sometimes its Google. Our expectations are different and I have this kind of expectation perhaps the person that introduced me they only have this expectation so they paint a very nice picture and if you spoke to the sales person, of course the sales person is a pleasant person and they painted us like a freehand picture and we bought it.

F : And how did you find out? So you went on a site visit or something.

INTERVIEWEE: Sometimes when we are fortunate we find them during site visit, the unfortunate cases where we actually place an order and then continue which causes into another mess.

F : Of course what was the other problems that you mentioned before.

INTERVIEWEE: Post Service.

FR: How do you deal with post service?

INTERVIEWEE: If we have a choice then we choose not to deal with it, we just eliminate it. If we do not have a choice, then we have to work with them on it.

F : In the case of post service you mentioned auditing, your vendor is still here. What is the process for your auditing? Your auditing processes. So you mentioned you had approximately 30 active suppliers on your list. How do you go about auditing?

INTERVIEWEE: Depending on the category of the suppliers. Not all require to be audited and due to our limited resources as well, the buyer which is ISO certified we will assume that they have been audited annually by whoever the certification authority is. So we just skip the audit process for the ones with ISO certified.

F : And these are the ones that are highlighted by post service or is it delivery time or what are the things you look for to audit?

INTERVIEWEE: Maintenance, whether they have the equipment to manufacture, quality, whether their quality system is in place.

F : When you take on a supplier, the evaluation that I was speaking about before was that do you give them a trial by and then you put them onto your.. How do they move from point A to point B. What process happens between here and there. Or do you just buy from them and wait and see what happens.

INTERVIEWEE: Yes most of time, we buy from them and see what happens.

FR: Is there a particular time? Is it just like one transaction that you look at or you look at 2 or 3 and then you access?

INTERVIEWEE: Actually the first one would give you a strong hint. If they are good then we will order again. If they are not good then we forget about them.

F : But do they remain on your supplier list but as an inactive.

INTERVIEWEE: yes

FR: So we move into the information technology aspect of it now. In your thoughts do you say that using information technology to support your suppliers selection decision making process. Is it beneficial?

INTERVIEWEE: You have to elaborate on that

FR: If you didn't have google how would you have been able to find your suppliers besides word of mouth? Or do you feel by using internet or google has expanded your knowledge in suppliers? As mentioned before the majority of your suppliers are by word of mouth.

INTERVIEWEE: Obviously with IT. It will help because there will be things that we have not accounted for. So definitely we require IT systems to help us understand and source better.

F : Ok. Do you use any information technology or do you use Google?

INTERVIEWEE: Google.

FR: Also. Do you use Microsoft databases or any type of other systems to record your suppliers? What do you use in-house?

INTERVIEWEE: well If we have enough time then we are using some accounting system, some simple system that can evaluate database of all the branches and first of all the transaction will be done with the accounting system. It will be Microsoft office

FR: Do you mind telling me what's the name of that system?

INTERVIEWEE: SQL.

FR: Ok. So you record your suppliers as well through this system.

INTERVIEWEE: ya

F : Ok. The type of data that you store in your database for your suppliers will be name, location, contact. Is there any other different type of fields or any other type of information that you store on your suppliers?

INTERVIEWEE: I think that's basically it for now.

FR: The type of material that is used.

INTERVIEWEE: Those we do not put in our database because there's no such function in our system for it.

F : And with respects to auditing, do you audit the database of your supplier at your end and your in-house database. Do you audit to make sure that the information there is correct and accurate?

INTERVIEWEE: Well annually we do have internal audit.

F : And could you tell me what do you look at?

INTERVIEWEE: Everything that is mentioned in our ISO procedures, In their quality systems.

F : Ok. Are there any problems or any issues that you currently experience with your current system?

INTERVIEWEE: There used to be SAPs and of course its painful with SAPs to dispatch our past system. But we don't have choice. Resources is always an issue. Once we are ready we will probably move back to ERP.

FR: So basically you have limitations with your resources?

INTERVIEWEE: yes

FR: Ok I think that was my last question for you. You have been very useful.

INTERVIEWEE: Thank you it's good to know that

F : Especially with how you locate your suppliers. I think you are one of the very few that I have interviewed that actually used societies. Most people they use like Ali baba and so forth. Maybe it's because of the type of business that you do. Even so you are one of the few that have used societies and I was quite interested in that because in the United Kingdom and in the western businesses they do rely heavily on societies and I was just wanting to understand, do you really think this has been beneficial. What made you decide to use a society?

INTERVIEWEE: Again resources. We don't have the kind of resources to waste on traders so might as well ask for recommendations

FR: Do you use the LinkedIn?

INTERVIEWEE: I do. But again in terms of reliability, I am not so sure. How reliable it is I am not so sure. So even the information that I receive from LinkedIn.

FR: Because you could also create a company profile on LinkedIn instead of personal. And they could also link to different societies as well. But this matter is Malaysian only. Is it? But is there any international societies that you are a part of, if you are doing good in Europe and America. How are they finding it. Are they finding you serious societies? Have you ever found jobs through a society through an international company?

INTERVIEWEE: well recently we received a French inquiry 'fire matter'. So I think.

FR: I think fire matter is also associated with other worldwide societies. I will check on that too. Thank you very much for your time.

INTERVIEWEE: No worries. I know Malaysia for one useful informational technology. Most people are using that.

FR: which one?

INTERVIEWEE: Facebook.

FR: Really. Are people really using Facebook a lot?

INTERVIEWEE: Yes.

FR: As in For Business?

## Case E

FR: So could you tell me a little bit about the company?

Interviewee: yea, I think Intel is just a world larger chip maker, I think its also world leading on the manufacture on the computer networking and communication product. And right now if you really know about Intel right now we are also marching towards on the mobiles.. I mean mobile view. So from that you can see that this company we have the semi- conductor memory product, so from there, you know. I would say that we have all the.. uuhh. How do I say this. Because of this we have all this computer, notebook and several others… So we also involving our many different processors on the different country location.ok?

F: ok, Can you tell me what countries that business was conducted with?

Interviewee: We have world wide. You can see you know if you asking me where intel located, I think we have whole world wide like we have intel Arizona, Intel Costa Rica, probably Costa Rica at this moment because of what happened last year because the production operation have been closed down already. And we have Asian, we have intel Chengdu.

F: Oh in China?

Interviewee: Yes We have intel Chengdu , and we have, intel Vietnam and intel Malaysia. All these site I mention to you is more on the production side which is assembly test area. And besides that we have Intel Shanghai, Intel Singapore Intel UK, Ireland, more of these countries probably in the sales and marketing.

F: Where are they located in the UK?

: I do not really know the location, but I know that company would be more on the marketing area, probably you can search it from the website. Last time I am actually the senior supply chain analysis in Intel so my role would be more supporting on the production and purchase.

F: So we are moving to the second section of the questions will be focusing on the supplier selection process. So in much detail as possible, can you explain to me the supplier selection process?

: ok. In Intel, we do have a supply selection step. Total, we have nine step to go for it. Every time when we have a supply selection, a full blown supply selection, we need to identify the nine steps. First of all, the first step is we need to have the supply need identified.

F: Yes.

: Second, we need to form a supplier selection team member.

F: Could you explain to me what is a supplier selection team member?

: Ok. You can see the supply selection is more related to procurement right?

F: Yes.

: but sometimes, I think this is one of the questions whether the selection decision will be from, from which member. So I think from that, I just want to answer you, supply selection team member will include; first of all we have a purchasing rep.

F: Yes

: We have a stakeholder, the stakeholder can be, you know, in the production, in your logistics, which is more the project related to them, and I think we also have finance people to help us with the financial assessment. We may have the technical people, to help us to assess on the drawing, to perform some of the testing. Yes, this is the selection team member.

F: Ok. But you mentioned nine steps before, could we go back to that?

: Sure. The first step is identify the supply need.

F: Mhmm.

: first of all we need to know what is the objective. When you conduct supply selection, you need to know what selection you would like to conduct. So you need to go through, identify who are they. Ok?

F: Yes.

: Later on, second step, you need to have a supply selection team member form.

F: Ok.

: so in the team member form, we'll be including procurement, finance, your stakeholder. Your stakeholder can be, depends on which area, can be production, can be logistics, can be the person who relates to other supply selection. Correct?

F: Yes.

: So the third step is to assess the internal and external environment.

F: So it's something like a SWOT analysis you're trying to perform.

: Right, yes. I will say that when we assess the internal and external environment using the SWOT or we are adding…you also mentioned B. I. B. I. is also part of that, the Business Intelligence. So from that, the Business Intelligence you are able to know how is the market on this particular product. So how is the situation look like. Ok?

F: Ok.

00:10:00

: So after that when we performing the third step, we go back to the defined requirement. We need to know what is our spec. like for example, we would like to have a selection on gloves, just an example, so from that we need to know about this nitro glove, what is our spec. the sizes, the strengthener, when we go for etc. All the spec will be defined.

F: OK.

: Then the number five step is we need to issue some CNDA, which is the Confidential Non-Disclosure Agreement. We need to have the supply shortlisted to sign on the CNDA. Whatever type of selection is confidential is not able to be disclosed to the other body. OK?

F: Yes

: So, number six step, we have a supply evaluation and selection. So the evaluation will be including a lot of the activity, such as we may gather the input, visit the supplier, understand what is the supplier production, the where they are. So from that, the supply selection team will become all the metrics,

what is the metric you would want to look at. Probably, I think various kind in our company Intel Technology will be looking to see what; which is cost, quality, technology, service, and financial...

F: Stability?

: Yes. So we always did a CQAT. 'C' stands for Cost, 'Q' stands for Quality, 'A' actually is Call Availability, 'T' is Technology. So availability can be part of the service and also financial stability.

F: OK. Alright. Cause that also answers the third question which is

: Yes.

F: So there's that one. Alright.

: You can go through step by step because I know now when I share with you a nice step with the summary evaluation, you are able to know that some of the answers are related to your following question.

F: So how, could you answer me, how were the suppliers located or sourced when you were at that company, how did you find them?

: Ok, there is a few ways, let me share some of them with you.

F: OK.

: OK, first of all, we will look at our incumbent supplier, which is our current supply database. We may have a different supplier. No, I think I will say that we have many suppliers, some of the suppliers they have the same capabilities. First of all, we look at our incumbent supplier which is our internal suppliers, whether we have the same capability supplier then we shortlist them out. Then

F: Could I ask a question before you continue, you mentioned internal supplier. What do you mean when you say the internal supplier? Is this a supplier that is already on your supplier selection list, an approved supplier?

: Yes. He is already an approved supplier so AVL, Approved Vendor List in our database already.

F: OK, thank you.

: Mhmm, so from that we also go back to the media, like sometimes we go back to the SME to source it when we go to that area, they are able to list out all companies that have been registered with them; so who are they, what category, what is the major business they are. so from that we are able to filter out which is the supply we are looking at.

F: OK.

: Sometime we also use some, like, I think Google search is very simple but when you search it, when you ask me where is the location. So that would depend on when you conducting a supply selection, what product you are looking at.

F: Exactly.

: Correct. Say just quoting an example lets say you are looking on the corigated boxes. Let's say this supply selection is only mainly for Intel Malaysia, definitely when I'm looking for the supply location, I will resource surrounding Malaysia opening… not very far, far away. Lets say my supply selection objective, the scope I'm going to virtual factories like Intel Chengdu, Vietnam, Costa Rica, or Arizona, then the scope wise, when I allocate the supply location will be different. We also need to know that

particular product in that country, whether they do have sufficient supplier having the capability on the corrugated. So that location is very subjective, it depends when you try the supply selection.

you want to look at locally to support local, or you want to look at the global supply to support globalization.

F: Ok, let's just say for instance, because you mentioned that in the production aspect of this process, so you were only mainly dealing with Malaysia? Or you were also with the other countries like Arizona, Chengdu etc…

: Actually I also dealing with other sites like Chengdu and Vietnam. Like, I actually play a role in commodity measure role, to supporting the globalization under product.

F: Let's say for instance you were making up a part of an item let's say for Chengdu, you source your suppliers from Chengdu.

: Yes, because of my strategy is, when I do a supply selection,for example we talking for example glove ok? When I want to buy glove but I when I do a supply selection, it's a virtual factory supply selection. So every site Malaysia, I would short list as Malaysias supplier, Chengdu would be short listed Chengdu supplier, Vietnam, would be short listed Vietnam short listed supplier.

F : So, ok, so in the at case if it is you are sourcing a supplier in Chengdu for an item in Chengdu, how are those suppliers placed on the approved vendor list, the AVL, if you are in Malaysia, is this done in a procurement team in Chengdu?

: yes we have a procurement in Intel Chengdu.

F : So what they would do, lets say you were in Malaysia, you will find the suppliers in Malaysia you put it on the Malaysian list, the people in Chengdu would find their supplier put it on the Chengdu list, the Vietnamese they would do the same?

: yes…

F: So basically you are building a very big global approved vendor list?

: Correct.

F: Alright ok.

: Because we have a deeper legal entity for the different sites.

F: So since this company is worldwide do you feel that the selection process is different or let's say your approved vendor list, is it different and how it is you source your suppliers as well as to store your suppliers as compared to local Malaysian companies?

: Can you repeat your question?

F: You explained to me that in every country that operates with this company, they go out and they source their vendors and they put it on a global vendor list right?

: Correct, correct.

F: so, in my previous interviews with Malaysian manufacturing companies, how they did their vendor list,their approved vendor list, is they find them on google or they use mobile applications and word of mouth and so forth, what I'm trying to ask is seeing this intel company is worldwide based, it's a global company, do you feel that the process itself for the vendor list is different to that of local Malaysia companies?

: I would say that you know we have some supplier we would extend it, like for example, when I engaging a supplier in Intel Chengdu, and I thought that the supplier is able to supply Intel Malaysia I can drag that supplier into the Intel Malaysia database and support it accordingly.

F: but is this a procedure that is brought from head office, like the Intel head office that every single Intel subsidiary will have to take on this process.

: No not necessary. It depends on your need, because for some supplier we know that supplier is able to support on the globalization model so we will be promoting that supplier across all our Intel sites.

F: Ah, ok and maybe because the company is larger in size…

. And to answer your question also, if you asking me whether Intel Chengdu use their own supply selection and Malaysia using their own? I would say it's a standard across, because we have a standard specs for the virtual factory, we using the same specs, same policy to conduct the supply selection.

F: That makes sense, I think it's because of the size of the company as well as well as the distribution channels and what the end product is, because some the companies I have been interviewing here in Malaysia, its more project based where it is the using raw material and they are making a particular product for a particular client.

F : For a particular client, whereas the client from Intel, at the end point, the end product is a computer or a mobile or whatever. Okay, so I understand that. So you already explained to me what is the most pertinent supplier selection criteria and so, the other one is can you tell me if there are cases where the supplier selection criteria would differ from the usual process of selection.
- Yes it can, because of, is different, different product you have a different criteria. Let me quote you a few example okay, let me give one example talking about a clean room.
- F : First thing, what is a clean room?
- Clean room, you know, you know when we have a production you need to the smoke with the safety glasses, you know, make sure that you don't have the micro-contamination, bringing on that so ,like you know, your glove, your watch , your cotton bud, all of this is the clean room product, so I can give you an example like you have a different supply selection item, your criteria will be different. Like, just think of BK item you know that BK last time in the automation company right? So they are more on tooling and fabrication so when I'm conducting the supply selection is the cart you know the cart like when you go to you know, that is put in, the food put in the trolley, then, you know, that is the cart but this cart is also using in production so from then when I want to supply selection on that cart, so my criteria will be different. First of all I just want to make sure that the cart has a good quality and technology, so with good quality and technology I will define a very detailed criteria. like first of all, I need to make sure that the cart, the wheel, need to be able to be supporting the weight like up to 400kg or 300kg because I know that I'm going to put my chip inside so every lot from the production put into the cart, like for example the people tell me every cart you need to make sure that I have two lot of the microchips, so from then I'll ask two lot of micro chips is total bid is how much, so they say it's 200kg.

Definitely when I put things in supply selection criteria on that cart to BK and I'll say that hey you need to make sure that the four wheels in the cart to make sure that the cart's spec will be more than 200KG. If not, this will be spoiled. You get what I mean? This is one example. And I think if you're talking about technology, so I also want to make sure that my cart will be able to push in the right way. You get what I mean? Like design it, you know..

F: So basically, everything that you do there is a technical requirement of the item that is being needed is going to impact the supplier selection.

- Yes, and another example I can tell you, like, laundry. We know the small and boots, like you know, in the production you're wearing like body suit, cover your eye, cover your body everything that, we can't see your face. So you see all this body suit, you know, after when every time when the manufacturer specialist they wear them then they throw them into the bin we are responsible to bring all this out and the boots to the laundry people to wash it, you know, if you wash it, if you put it your own home washing machine, that's different, because of, we have , you know, how do you call that, some time you put in our detergent will be different really. You compare it to the laundry in the industry is totally different, so when I'm conducting this laundry selection, I'm also looking on the different aspect, like you know, we have different criteria, like, we want to look at, make sure that, we have right layout from the supplier, how they wash it, they use what type of water, they have a systematic process to clean all the unclear process to make sure that in the control on the clean room environment.

- F : Is it something like, is it something environmental supply selection criteria that impacts on that?
- Yes correct, this is one of the criteria, we want to say that hey, I need to ensure that you have that particular technology or service, you know, clean room some of the supply when I visit them, they don't have the proper control you know, they bring back all the unclear and boots they just dump into the one big drum, but they don't have the proper people to control, like how to seperate it out the right boots and the unclear and then they're washing. When they're washing it out are they have a proper s process, are they have the right washing process. You get what I mean? So you can see that it's a different, if you're asking me, it's a different criteria that I will say yes your criteria will be; your supply selection criteria will be defined and set based on the item that you want to select.
- F : Okay.
- It cannot be standard.
- F : It cannot be standard, yeah.
- But, you can use the standard category like what I mentioned just now like cost, quality, availability, technology and services, from that you can evaluate the cost I think the cost is pretty simple, I just want to have a right cost, but sometimes your supply selection, your selection, your cost, your unclear can be lower score because you know that hey, this item you want to have a very good quality and good technology definitely my cost was not my focus already because I want to be having a good quality and technology, my cost will be increase ready so when you do a scoring on the unclear on the supply selection your cost will be low down already, then you put more score in the quality and technology. You get what I mean? So from then you know, like, you can use all this category CQAT for you to define. Hey I want to look at quality. What quality I want to look at the cart, what quality I want to look at the laundry. You get what I mean? So from there you ask yourself all this selection criteria not only determine by the leader, like me and the leader, but definitely I'll bring back to my supply selection team, because of my supply selection team I do have a stakeholder playing a very major role. They are the end costumer that is going to receive the item. They should tell me what they want.
- F : Exactly, because those are one of your criteria as you mentioned before in your first step of selection you need to figure out what are the objectives.

- Yes.
- F: You need to know what is the objectives obviously for you to make a particular item for it. So that completely makes sense; interestingly enough in the research in the current research of supply selection now, there are 23 indentify criteria and the list is definitely growing as different markets are expanding and different criteria is becoming more and more useful, well not useful, but required by the end user and right now technical ability is climbing because technical ability was actually nearly till the end, and now it is climbing because of how advanced items and products and so for it is being required by the end user so therefore it makes perfect sense and what I found interesting in my current research now is before when I did these interviews about maybe 2 or 3 years ago the most pertinent criteria that wasn't looked at, at that point in time was cost. And what I found interesting now…
- I think if looking on the cost I will say that this is my daily task. Every time I just want to negotiate the lower cost. But I need to ask myself when I have a lower cost, when I get the item, is it that item is able to meet all my requirements or helping on the span life on the item. I'm willing to pay a higher cost with a longer life span then you know reduce the productivity and all the starting. We need to ask our self which one you want.
- F: What I found now in the research that I'm doing and all the interviews that I've conducted so far, is that quality and delivery time has actually come before pricing, and then in the events of some companies that has the service that has to provide services also, moving up over cost as well, so it is changing, the requirements are changing all the time.
- You know, I just want to add on like, the services, like they add on the value at the service, like you know, today when I'm conducting the supply change I don't want to hold so many inventory I unclear process or just in time process. I want the supplier to be hold responsibility, to hold the liability, to keep track the inventory is there for me.
- F: Oh.
- Yes, that is one of the services.
- F: So you are not doing inventory control they are.
- Yes correct, so you can see that in the past every time you just buy, then the inventory coming to you then you have a warehouse allocated you need to have a warehouse people to manage your stocks. But today when I have a supply selection I may come on one of the service criteria and let's say I want to have an item carried in the boxes, the boxes is too bulky I don't want to hold the liability. I may come and tell a supplier, when I have a supply selection I want you to have your own boarder warehouse, I want you to have your own manpower, to manage me in adjusting time or I want you to manage in the unclear start. The unclear start is like, you know, every item will be kept by the supply site, supplier have their own manpower to keep tracking, they only deliver when we call. So whatever inventory at the warehouse is not the liability to the costumer, they're holding the liability.
- F :Exactly. And this is also done in your, this is also signed in your confidential, non disclosure agreement as well.
- Yes. Yes.
- F : Okay. Alright. Alright so, we move on to the other one. So you mentioned before that you have an approved vendor list. Is there any form of evaluation that is done maybe in a month, 3 months, 6 months to a year, is there any sort of auditing or evaluation process that is done on this approved vendor list.
- No. I think, you know, for the approved vendor list , although we have a policy and a process, so I think from that ,to engaging the supply to the approved supply list will probably take about two weeks, two or three weeks, we are able to complete the whole process really. Because, you know, some supply we need to get some of the information, like they are providing us a three year financial report we also don't want to be engaging a two dollars company and we were asking a three years financial report and then in my supply selection team I have a finance people I'm right ? so they help us to be assessed on their ratio like their debt ratio, you know,

the collection ratio, you know, all this ratio to ensure that that supply is not a two dollar company or high risk company.

- F: Because also you mentioned before financial stability was one of the criteria as well so that makes sense.
- Yes. Because in Intel we don't want to be engaging one of the company in high risk or is going to bankruptcy or they're too dependent, the high dependency, dependency is very interesting topic. You see, today in Intel will engage you, maybe the supply they don't have the customers based they only depends on Intel. So let's say today Intel business decision change suddenly we put the decision that we don't want to order from you we would like to stop this project, then the supplier can be bankrupt anytime or you know, that company will stop all the operations they don't have the business from Intel. So if their true dependency on Intel, Intel also not consider them. They're not part of the short list at least.
- F : Yeah. So therefore you don't want their business model to be only with the company Intel you want to ensure that they're interacting and doing business with other companies as well.
- We have a policy; it cannot be more than 25%.
- F: Oh.
- Yeah we look at the revenue report. When we look at the revenue report versus the auditors report vs the sales. When we compare it out we are able to know whether the dependency is high or low so if let's say more than 25%, we consider this aa high risk. From that is already in the red color for me but at the same time I will asses other ratio.
- F : That makes sense because just in case you decide not use to them a supplier again they are out of the business.
- Yes
- F : Exactly. So who is responsible for the decision making process?
- Whole team member. Whole supply team member. Because we have a scoring, we have a scoring based on the category or the criteria and first of all before the supply selection, each category or each criteria we need to have a weightage score their already like example, we looking on cost, we say that for example, we put on cost as 25 mark, quality 25 mark, ability 50 mark, technology 20 mark, services 50 mark and unclear 33:58 100 mark. So from then I have each category I have assembled all the detail so from that the team will give a scoring. So when we give all this scoring then we will score and we compare which is the highest score and what we want to look at then the team will make a decision.
- F : But when you categorize these different criteria on your list and you make a score versus each one how do you come up with these scores? What are the things that you look at?
- The score is also predefined before the start of the supply selection. Mean to say that all the supply selection team member need to be agree upon in their scoring. So like for example, I put, I say that cost is very important, I say that 35. Maybe other people will say no, no, no for me I feel technology is more important I want to be reduced at 20 score on the cost. So from then, you know, the team has been, need to be agreed upon. All this scoring will be pre, you know, all this score need to be defined out pre define the supplier and everything because we just want to ensure that no buyers.
- F : Right. Exactly. Yeah. Because that is actually coming into one of the, which I will get back to in the other section of managerial concerns is that, some of the supplier selection I realize is a bit biased. And, it usually probably happens in smaller businesses, small to medium enterprises, as you get into larger enterprises its more process driven and again I think that has, being the type of corporation that Intel is I think that they come away from being biased and nepotism and so forth. And word of mouth, it comes into more structured process.
- Yes. I like your answer.
- F :It's more streamlined.
- So you can see that you know, actually I just want to share with you my experience. About one time, you know, in the year of 2010 when I'm contacting a laundry supplier. You know, the supplier when the results coming tell me "Aily I'm not agree with, I don't know why I'm not

shortlisted to be the one on this business. I know that my price is much, much more cheaper than the other. Why I'm not selected?" So from that, you know, although I'll be sending them a message to say that hey, you know, you are not shortlisted thanks for participating. But I will tell them to come back to meet and I'll conduct a face to face meeting with them and tell them where you are. Although your price is cheaper, but I'm looking on your technology and quality. So you're not meeting me. So you know, I spend about one hour to explain to them but I'm not showing the data because a lot of data can be confidential because all the scoring, I did not disclose to them what is your score, you're in rank 2 or rank 1, although you are rank 1, but you are not to be selected because I go to the rank 2, the reason why we want to look at other aspects. You get what I mean? So from then, MD the managing director come and tell me : now they're happily and they're very satisfied because that person told me in the past when we have all this supply selection we had a company they just close it and then maybe in the relationship or whatever then that business has been awarded you get what I mean?

- F :Yeah. I heard some very scary stories recently as I'm doing the interviews and one of them was a company, they actually decided that okay, so they will send some information via email cause this is how they market their company and the company was looking for this particular supplier, they said okay fine since you have what I need I will put you on my approved supplier list because they didn't do a proper evaluation because some companies they just don't do the evaluation some companies I realize again there is not a particular generalized or streamlined process how it is they evaluate. Sometimes they put on a supplier onto their list and they give them a trial buy and this is how they evaluate them.
- Yeah and you know one thing is, you know, in our company we have a policy, when you in the supply selection team, every supply selection team member need to file a declaration form, make sure all short listed suppliers you don't have a share there, you don't have the relationship there, you're not, your cousin, or your boyfriend, your girlfriend, or your father, your aunty, uncle business we need to sign all this forms.
- F :And then after which what happened is that, they were expecting a delivery of a product within 4 days and they didn't get it so then they decided to do a site visit, when they got to the site it was nothing there, it was no, nothing, it was literally just like an empty warehouse. So it was some very scary stories that I heard so far while doing these interviews.
- But I just want to add on one information to you, just you asked me a question who make the decision I'm right? I say that it's the supply selection team member, whole team member to make a selection. But I just want to add on one thing: actually we're using one model is called rapid model. Do you hear that?
- F :Rapid
- Yes. Like we're using who are the role playing on the recommend, like who playing a role on the agreed, who playing a role onto performing, who playing a role on input, and who are the designed. Rapid model.
- F : Oh, so this is a searching process.
- That is a rapid model. If you go to the, I think you are able to find this information from Google, you put there rapid decision model and you're able to see the few charts sharing all that. So from that, you know, when we have a form of team

40:00

- When we have a like, selection team member, the team lead, let's say he is a team lead, then you are in the role, playing the role of art. You get what I mean?
- F : Yes.
- So for that, that model will be help in case like you know, sometimes in the team discussion you are not able to get a line!
- F : Exactly.
- You are not able to get a line! Correct? So we are using that rapid model has been defined to say that when we come to that decision who are the D? Decision.
- F : Decision.

- Yes.
- F : That's quite interesting. I think what you are first person that has ever mentioned anything, as I said what you are explaining to me is very structured, it is very unlike everything that I ever heard thus far which is why again it comes back to the type of organization, the size of organization, that Intel it has to have a more structured approach than more small to medium enterprises.
- Yeah, like SME you know the small and medium enterprise company they may not have that, they may coming one good compared to second good then I select.
- F :Exactly, exactly, exactly, or somebody's cousin or somebody's brother or something like that,
- Yeah yeah yeah.
- F :But you see one of the question that I'm trying to answer especially in Malaysia is that in certain, in some literature it states that any company that's over 00 or between 00 to 50 is considered a large enterprise and then in some literature it states that anything that is under 50 it's a small to medium so there is not a set amount of employees to define the gap between small to medium to large.
- Yes.
- F :And how many people work for Intel?
- Oh, before, before layout this year, before layout should be we had about a 10,000 employees in Malaysia.
- F : Exactly that's the difference, it's a massive organization so I am also assuming companies like 3M who is also worldwide represented worldwide would have a more streamlined and integrated process like this because it will come to, when we get to the ICT present we can discuss more about that but in your opinion are there any issues or problems that comes to mind with this supplier selection process?
- What do you mean?
- F : So, In the whole aspect of whilst the, when, so when you have the approved vendor list or in the supplier evaluation which you mentioned to me the CQAT, C.Q.A.T, is there any problems or issues that comes to mind when that process is being conducted?
- I will say that if the team, if the team has been aligned you don't have that problem because some team members they are not clear what they want then that problem will be pending so you can see that with that you'll go back to our sponsor to make a decision, what is a right, right category to go for it, definitely you have this problem it depends on your problem is big or small.
- F : Of course, of course, because I think that in this case here with you I think seeing that the problem, the entire process seems to be very streamlined and you have a plan and you know exactly what's supposed to be done you have processes in place etc and you have a decision making model to come out with a supplier I don't particularly foresee any problems but a problem that I see is that it can come from the beginning where it is your client itself they don't know what they want so therefore the problems will trickle down like a waterfall effect.
- But I think personally because I'm leading a couple supplies selections, every time you know, when I'm leading the supply selection when I form the team, first of all I do internal team communication, tell them you need to make sure that attend the supply selection classes, understanding all the steps, what you need to do, and what you should do and the don'ts, so from then I would tell them that you know, today what is the problems tell me what we have now and what we want to be achieving of the objectives to have this supply selection, where we are now, so from then have all this alignment, so I will always say that the alignment, the communication alignment, is very very important we cannot say hey your are the A, B and C then we have a D
- F : It has to be the processes, the processes needs to be conducted in a particular order.
- Yes yes.
- F : Alright that definitely makes sense but yeah, I really am enjoying to listening about the processes so,

- Actually conducting supply selection is very fantastic job you know because you're, when you do the market intelligence you know, when you go out, because of when I do a supply selection I'm not sitting at an office you know, I visited all the shop listed supplier and let's say today I have gathered all this information like my, looking on my internal database supplier, looking for Google, and go back to some of the, like the factory, directory to get this information when I compare this information, I do a quick searching on that particular supplier location, where they are, what is their capability so from then I cannot visit all this 10 supplier I will short list what is a supplier you want to look at, so from then we will send them some of the very basic questionnaire so to answer us, so from then, once the answer coming in and for those is a short listed from 10 to become a 3 supplier then I go to visit that 3 supplier from that 3 supplier visited will we know that where they are really.
- F : So you mentioned a questionnairer, on this questionnaire does it, is it broken down in categories like financial stability, technical ability etc is it that is what is on the form?
- Yes, so from that you know I may ask them, you know, do you have your in house capability to do some welding , do you have how many machine? because I also want to know your capacity, because of when I give you capacity like 10,000 per week. are you have that machine capacity to be taking care of my loading, because some supplier tell me that I can do that, I can do that, when you go there, the factory it's just only a square empty.
- F : So basically, these are the forms that you take and these are the ones that you put on your evaluation, this is where you put the scoring so this is what you score from.
- Yes.
- F : Ok, I get it now, alright.
- So you can see that number six step, you know, is a really really long process; you know, it's just put that evaluation, how long evaluation? That process will be taking me very long.
- F : How long does it usually take?
- Yeah?
- F : How long does it usually take? The evaluation?
- Depends you know, actually every supply selection we're conducting we should set the target where we want to meet, some of the selection will be taking me three months, so the evaluation depends on the commodity we want that sometimes some of the evaluation will take me about one month.
- F : Wow!
- You know, I happened to conduct one supply selection six months to complete it.
- F : Wow!
- Because of we wanted to have all the sample gloves meeting to us we want to do all the tests internally, we want to have the test result to meet on our span, we drive that above six months.
- F : Wow, that's a long time.
- Yes, because you can see that sometimes they provide me a nitride glove wearing it to the production floor so I need to know that that glove touching on that unit will have any issue or not, we need to make sure that no fingerprint on that, and after derailing that, I just want to make sure that my manufacturing specialist don't find that like sensitive on the skin.
- F : Of course, of course, exactly.
- There are issues, so you can see that some suppliers not give me a one pair of glove you know they give me a 500 for a 100 sample size.
- F : So it's basically for you to do the quality and testing on it.
- No. My supply selection team and I engages a have engineering of technical engineering together with me, they are playing the role.
- F : I see, that's a long time.
- That is, but you can see that although I 48:47 unclear I need to acquire some of the technical background.
- F : Yeah, yeah.
- But I'm not an expert, when you're looking at the formula I hate it really,

- F : Oh God
- I don't know how to count; I don't know how, what is that, so some of the terms will make me hate it.
- F : I think I've chosen a very interesting and exciting field to get into, because as you're talking about it then everyone else that is spoken to, that is in this area they are quite excited and it's something that's always changing It's not something that is going to be the same every day.
- Yeah.
- F : So I think I've chosen well, okay so let's get into the information technology part of it.
- Before you proceed just know I said number six process is evaluation I'm right, do you want to continue and know the three more steps? Just at least you can capture it?
- F : Yes please, yes.
- Okay so I think just now I mentioned that we have a few steps, I'm right? So just now I stopped at evaluation I'm right?
- F : Evaluation yes.
- Yes, so the number 7 step, let me see on that...
- F : Do you have any document with these steps?
- Actually I do have but I think I can copy and paste to you but I will remove out some of the bullet points because I fear that that is, you know..
- F : That's confidential.
- Yes correct, because of, I don't want to disclose, you know, what is the elements and look at that particular category, so I can give you, I can give you the bullet point like you know, one to nine step.
- F : Yeah that will be really, really useful
- Yeah, yeah, yeah, so actually number seven step is very simple really, after you have evaluation selection then you need to be conclude that I'm right so from then you will have all these conclusion recommendation and then you'll do a supply debrief. Actually after this, you know, I can roughly send you a very high level overview on this nine step.
- F : Oh that will be really fantastic actually.
- 50:55
- Yes, then you don't need to remember all that, but from there when you see a nice step, you lost it or whatever we can communicate through the email then, I can further tell you this thing.
- F : That will be fantastic
- Though I'm now working on that department for almost one year already.
- F : Well you know it inside out.
- Pardon?
- F : I said you know it like the back of your hand.
- Ah, yeah.
- F : Ok, so the information technology. What are your thoughts on having information technology, business intelligence or artificial intelligence support for supplier selection?
- Can you share with me your information communication technologies refer to what?
- F : Okay so I am looking at, okay, so before when in 01 , I interviewed some small to medium enterprises and to be quite honest with you there was literally no process, they use computers but as in they didn't use, like, excel for instance, you know how some companies they may not have, like, a business intelligence tool or any type of tool they didn't even use excel data basis to support or even to store their suppliers at all. I have worked into places here in Malaysia that you literally have white boards and you have the suppliers name listed one to ten and you have their names literally and what was my main concern there is let's just say ok so maybe you've had one person who has been dealing with these particular 10 suppliers for maybe twenty years, well let's just say that they either retire or they die or the situation changes they take that information with them. So, even I am even looking at simple things of information technology by the uses of computers because they would not even computerized or the business

intelligence too that I was even looking at was just everything, I was even looking at something even simple like databases like if it is there we're using excel databases but just excel spreadsheets on a whole just to at least store your suppliers contacts details what type of materials do they provide, their last supply evaluation, etc. And the artificial intelligence tools this is something that I am trying to bring to the table because I have so far I know that it is not being highly used anywhere. Because when I've asked this question previously even to the same managers who are completely manual they tell me they are not going to waste money behind information technology to support them because they don't see the need for it. So coming back to my question, do you think that having information technology or business intelligence is it beneficial?

- Yes.
- F : In the decision making process, is it beneficial?
- Yes. It's a very advantage to us. And you can see that, I just want to share it, in Intel we have internet negotiation. We have internet bidding.
- F : Internet bidding.
- Did you hear I.N before?
- F : Yeah.
- Yeah so that's why, you know, in the past few years actually we have conducted internet negotiation so mean to say that it's some sort of supply selection it's the same thing we are using the same nine step but when they're bidding they will go into the, like, bidding system, like, we tell them when is the date of the bidding, and what product we want to look at this is the total volume for the part … so these products they will bidding the pricing so we tell them this bidding is take you above 45 minutes or 1 hour then they will go into bid ready.
- F : Does it operate like E-bay?
- Yes. But I think we stopped this for a couple of years the reason why, because of, you know, some suppliers they do not know, they don't have that knowledge to operate on that, because of when you do the bidding you need to be very fast to enter the pricing, you need to make sure that your system set up should be very fast so some of the suppliers come back to tell us and say oh at the time my wireless went out so that's why I'm not able to bid because at the time I don't understand your bid on that product .. so I quote the wrong price.
- F : Exactly . So actually that's one of the things, one of my findings as well is that some people they say they don't need to use information technology, they don't see the point of it, they don't know how to use it and yes,
- They don't know how to use the tools, then they don't understand that when you're bidding you need to be very fast then they say after the entry the keyboard is not function.
- F : One of the managers was explaining to me, like, his father for instance, you know, they had basic education and they didn't learn anything about computers and then they send their children to school that had more knowledge in computers and basically the children, the upcoming generation, who is going to take over these businesses, they may integrate information technology into their businesses, but as of today they don't see the need for it, I was quite surprised when I walked into one of these companies and I saw all of these suppliers they literally did like all of the suppliers on the left and they put like tick boxes, they drew lines like a checkered book and they literally said okay did I use this supplier on check box and they were literally using pens and paper and I was thinking to myself But wait suppose, cause I even spoke to them about natural disasters and so for, suppose they get flooded or suppose an earthquake happen, what is going to happened to their data? There is no backup there is nothing there for them to get their data at all. So when I asked them do they see the importance of information technology they literally looked at me and said no. So I asked them how you do your reports. They said that they don't do reports; they know who they do business with so they know who they go to.
- We need, giving that we have E-bidding you know after when we're conducting these bidding we need to put in the excel bidding, we need to have a clear snapshot on that bidding the graph

you know so at least you store all this in the data base like, who are they, the supplier, what time they conclude it .and this screen snapshot we are able to get all this history from the IN too. So at least when we will capture this and we will send it back to the supplier so this is a clean snapshot that we capture it and the time is time off and etc.

- F : Exactly cause you're ensuring transparency there was fairness and equality and how this happened yeah that makes sense. I actually didn't know that Intel uses E-bidding, and this, is it only done in Malaysia or is it done in all of the different subsidiaries.
- Worldwide, worldwide.
- F : Worldwide, okay.
- Yeah, even you know, when we have all these we will let identify the black belt people to become a trainer so that group of people will be attending the training you know then they become a black belt so they will train out the white belt, you know, all this like yellow belt, like taekwondo, you know? We will get all the stars trained.
- F : That sounds pretty cool actually. And of course it definitely does support your decision making because in this case if it is E-bidding whoever bided whom this is what happens and then you run through the supplier evaluation with them as well.
- Yes, correct. Actually although we have E-bidding the supply selection, that step is totally the same because in time we need to know what we want to achieve so from that the E-bidding is only like, you know you go in there you just tell me what will surprise them you look at that then we are based on that to give a score ready so maybe from that we say hey, you have the lower score then we'll give you the high mark on that because of your low score on the cost, your cost is very attractive compared to the others then probably you get a high score in the cost area
- F : So what I'm assuming that the E-bidding is doing it is creating a short list for you, for which suppliers that you are going to evaluate.
- Yeah.
- F : Yeah, it makes sense. Alright. So, could you tell me, what are the business intelligence tools and information technology tools that are used to support this? So you mentioned that you use Excel. So after you use the E-bidding, can you tell me what system, what program is this E-bidding done on?
- : Mmm.What do you mean, what system?
- F: So, where is the E-bidding conducted? Do they go online?
- : They go on time.
- F: Online, and on what site?
- : What do you mean, what site?
- F: Like, you know how it is you go on Ebay to bid on different items?
- : Yeah.
- F: What forum is used for this E-bidding?
- : Actually, I'm not—OK, right now, I mean, I have an E-bidding—let's say I have a different product that comes from a different lot. So the lot 1 directly jump to lot 2 .
- F: No, I mean where is it done? OK, so you see—
- : Oh, where is it done? I mean, for me, sitting at Intel site. Then the supplier is sitting at the company and there is real time, you go in and look online at everything.
- F: Online? Is there a particular website, or is it a log-in that you give to them, that they log in and –
- : Yes, yes. Actually there is an internet IN bidding software. There is a link, and then from that, before that, we were conducting a training to the supplier, how they are using on that end, how they go and bid. So let's say today I say, "OK, tomorrow 9:00, the bidding will start." So everyone that has the link, we will send the invitation to the supplier to say that this is the bidding, you click on that link, everyone will go in in real time, on time, and bid. Then we will tell them the duration, like 1 hour, from 9 to 10, but from that, although it's 10:00 already, but they have, buffer time, like it's 10 minutes for you.

- F: Yeah, OK, so, apart from this bidding software, Excel is used, because after you do the screenshots and so forth it is stored on Excel, and what other information technology tools, or BI tools, are currently used?
- : I don't think we use any BI tools, but most of the tools we are using the Excel to compiling all the information, and to calculate out the percentage difference, etc.
- F: Any SAP is used?
- : Mmm, no, SAP is mostly like checking my volume and my order. I think SAP we are using where we attracting the data, on my one volume, you know? Report? Because, in the past, Intel used SAP, not Oracle.
- F: OK, so, you mentioned to me—So how does this—so you say financial stability as one of the criteria. How—is all of the departments, like finance, and procurement and everything, are all of these departments linked together by a particular software? How do you speak to each other? Let's just say, OK, so you have finance, you have accounting, and they probably will be the one that is responsible for taking money from your supplier, as well as—
- : Mm-hmm.
- F: Yeah, so how do they speak to each other? 'Cause procurement needs to speak to accounting. The two departments need to speak to each other. Do you do it by email or is there a particular software that is used that allows them to see what happens?
- : On the payment?
- F: On the payment, or like when a new supplier—
- : Oh. Everything—we have everything we go by E. OK?
- F: E?
- : E-Invoice. So first of all, all the POs, no need to manually, every time you send a PO release out, the supplier is able to go into the portal, which is a supply.intel.com portal for external.
- F: Oh so it's Intel's? All of the programs that are used in this is Intel programs?
- : Yes!
- F: All right. That's what I was trying to figure out.
- : First of all, this new supplier need to be registered on the portal and gone through the training. So every supplier, they have their marketing or finance people to train already. Marketing people will be trained on how to view our web PO. And finance people to view how they submit the E-Invoice. The web invoice. And finance also need to be trained, now, how to track the invoice status from our web invoice base. So everything will be E. So you can see that today, when they have any issue on that, they have a tracking status, they go in the supply.intel.com, and they can trace it by themselves, and check by themselves. Unless they are not able to find out, you know, the real information or whatever, they also have a one support—generic support, they can click it, like, you are singapore supplier Then you go back to the Singapore then we have people in the world wide web able to attend to you.
- F: Oh! So you basically have like a kind of a help desk.
- : Mm… yes!
- F: That's cool.

- : (laughs) Everything will be "E," it's not manual.
- F: Nothing manual.
- : Manual—even the invoice, there's no need to send a hard copy of an invoice to our AP. Everything you just post it accordingly, then the system will do a three way match. The three-way match means, you say the PO match the receiving, receiving match the finance, that's all.
- F: Mm. And all of these programs are Intel programs?
- : Yes
- F: They are not anything that was bought, like SAP-
- : No

- F: Or-- ‘cause another thing that I found, whilst I was doing these interviews, is that—so when I started, 2 years ago, or 3 years ago, most people, they were just using Excel and they were telling me that they had intent of
- : You will die!
- F: Exactly! They had intent of implementing SAP. And what I found now when I came back is that they had already implemented SAP, it did not work for them, and they then went back to—have you ever heard of, um, IME, I think it’s like an organization that makes software for Malaysian companies, and they have already got rid of SAP, and they started to look for something more simple, because they found that the SAP, for instance, was too advanced for their needs and it wasn’t meeting their needs as well. So they got rid of SAP and they put in different softwares as more suitable to them. So I was trying to figure out, like, what types of software that is currently being used? And
- : Yeah. Ours is not outside software, it’s our Intel, the Intel portal.
- F: So, back to the Intel portal. So that’s how your suppliers are recorded. So that is another question that I don’t need to ask you anyway. And, the type of data that you are storing with your suppliers, like, OK, so you mentioned to me just now that the suppliers, they need to register with Intel.
- : Mm-hmm.
- F: And everything is done via, I guess, email, so they get a link or something that they need to log in and they can trace everything.
- : Yes.
- F: But can you tell me—I assume that when they log in they will have something like a supplier profile where they will have their name, contact details. Is that type of information stored on the portal?
- : Yes. You’re able to see all this information on all the portal. You know, their name, you know, the address, even what type of company they’re owning, whether it’s a semicon or it’s electronics or etc, even who are their finance point of contact, marketing point of contact, you know, all these are things that need to be answered.
- F: Mm. OK.
- : And even that one company, you may create a different login ID. Like you have, finance people have one login ID, you have marketing or sales people have one login ID, so, we will not control that. But I think Intel also have one system to control process. Like every three months the system will be trickled back to the employee validation manager. So, like for example, just as an example, take myself, like myself, I’m from finance, you’re from sales department, right? So from that— two of us may have a different login ID and password. OK?
- F: Yeah, so it has different information that is more pertinent to ….
- : So maybe our boss has been nominated to become employee validation manager. So your boss will be playing a role, every three months to make sure that three, or the two of us, are still working at this company. Make sure that we are able to assess, continue to validate every three months. Because it is the case that some people left the company, we did not stop them (1 laughs), so sometimes you know when they go out, they can log in by themselves and check the order and they’re able to know what is the order has been given from Intel to them, then they can disclose the price to the competitor.
- F: I see, I see. But isn’t that something that is also supposed to be controlled by Human Resources?
- : Hmm… actually, that is one question; you know, when the employee validation manager come back they will ask you a question, have you validated the employee profile with HR? Or are you still recently communicating with them through email? I don’t know what option you choose.
- F: I see. So basically, this is not—so this is kind of like an online database.
- : Yeah.
- F: OK. ‘Cause this can be accessed by—it could be accessed globally.

- : Yes! And you know, when they register, they can register if they want to look at inter-Malaysia account, or inter-China, inter-Vietnam, inter Costa rica, Arizona??? Etc., which site they want to look at.

- F: And could they also give options to which subsidiary they would like to do business with? Like just say, you know like sometimes if you sign up for, let's just say a clothing store. And you know sometimes they give you the option at the bottom when you sign up with opening an account, they will tell you if you're interested in like jeans, or t-shirts, or something, and they will send you information about these things that you have selected.
- : No, we don't have it. We don't have that option.
- F: So a supplier, just because they are based in Malaysia, could they only do business with Intel Malaysia?
- : Not necessarily. Some of them, they are able to be having their own—I mean, some of them they are able to supporting from Malaysia to China or to Vietnam. Then they can also be engaging to the China or Vietnam database.
- F: But do they have a choice if they want to, or they don't want to?
- : Yes, they have a choice. They can tell us they want or they don't want. But I think most of the people the answer is yes, I want. Of course they want.
- F: Yes, of course they want. (both laugh). Is there any type of auditing process that happens on the database to ensure that the information is up to date and correct?
- : right? So we have, also, a share drive, you know, the main share drive on that; after that, we also have a backup, you know, every 6 months IT will help us to back up this data, all the things really. So with that, you know, we are able to retrieve all this information.
- F: But, like—just say, for instance, on the supplier profile itself, are they the ones inputting the information, like their name, contact, address, contact number, email address, or is it done on the Intel side?
- : We have a form for the supplier to fill out accordingly.
- F: Yeah, and then you input it. But let's just say you have a supplier, a supplier profile. You have a contact name for this supplier, and you have an email address for them, and let's just say this person leaves the company; they no longer work there. Is there any procedure that is put into place to show that this information that is currently on your website is accurate?
- : Mm… no. It's the only thing that, sometimes, we get to know, then we need to go into the database to uncheck it or disable it.
- F: Mm. Because, like, in the event of---'cause I'm assuming that sometimes they will give you their personal email, and it's not an email that goes to an inbox that is checked by someone. So let's just say you decided to select a particular supplier for a certain item, and then they don't respond to you because the information isn't correct. I was wondering if there was an auditing process that was done on the E-database.
- : We don't have it, but I think, you know, sometimes, one of suppliers, we have a few people—like, you know, when we're dealing with BK, I have a BK boss, I have their marketing people, I have the business development people, I have all these various people in my list. I cannot contact BK, I contact the other person.
- F: But is that common with a lot of the other suppliers, where you have more than one contact address for them?
- : Yes, very common.
- F. OK. Exactly. So if one goes, you have another one.
- : Mm-hmm.
- F: And let's just say you have some particular suppliers and so forth, and their product base, or the type of materials that they can provide to you, it expands, or they no longer do something, they no longer provide a particular product. How do you know about that as well?

- : Normally, we do have some agreement with the supplier. If they stop to produce that particular item or they're making a change or whatever, they need to be notifying us, you know, like sometimes, there are about two cases, like one case it's straightforward, end of life you are not going to be. So if they face up to us in the early stage, then we will work it out, what is the alternate source on that item?
- F: Yeah.
- : And in other cases, because of the materials that they need or sometimes, maybe this material's no longer in the marker ready. So sometimes, all these are outsider things, so that's why Intel always says that we want to be … we don't want to have a single source supplier. We try to be have source supplier. So at least we have two suppliers. One supplier is not able to support, then we can switch to the second supplier. But that depends, because some of the items is a single source supplier, they are the only one able to supporting us, then, that will be more critical.

- 1:15:01
- F: Has that incident ever happened, where there's only one supplier that's able to supply you with that particular product?
- : If, let's say, when we have all this ones only – I mean, one source supplier able to supporting us, so from that, the engineering needs to step in. What if we change it? What is the whole impact to the whole line?
- F: But has that ever happened before?
- : Yes.
- F: Really?
- : But it's only once in a blue moon.
- F: In a blue moon.
- : Not always happen. (both laugh)
- F: 'Cause I'm assuming that these things…
- : Not always, not always, but it's only one times, but at the end, we are able to conclude it, work out the alternate way, you know, to get the other part to replace it, and the other way, we get Engineering to have an engineering change, to swap it, and you know everyone need to be very aggressive to make a decision really.
- F. Mmm. Of course. You need to be on top of it. Of course. In the engineering aspect of it, when it is you have the supplier, the supplier profile as well, is the engineering requirements, the technical requirements, is that also stored under that particular project or that particular supplier's selection, like I guess case file if you want to call it? 'Cause I guess with every single time you contact a supplier it's for a different reason, to supply a different material. Do you also store the technical requirements for it as well?
- : Yes! Even Engineering, they have their own database to keep all the drawings and the specs. Maybe I'm contacting a supplier selection: they will track it from that system, then we will keep it from our end, and then when we sign it, when we contact supplier selection, or we sign the agreement or contract, we also attach the specs into that.
- F: I see. So if you have the other case, where it needs to be repeated, you don't have to go through that entire process again? You already have the requirements?
- : Mm.
- F: OK. Are there any problems or issues that you have experienced with the system in place?
- : So far, I think I don't have any problem. It's only thing that, like, how well will, you know, from ??? and them people, going to operate that. If everyone know how to use that. I can tell you, it's very simple process. Simple system.
- F: I guess—but you did mention that they provide training as well, to the users as well, but then again they may not understand it, because they're not using it every day.

- : So that's why sometimes when we have all this training, we would like to have the IT manager or IT folks, you know, very expert in these IT things, the person to attend the training.
- F: Mm. And usually do you have some of the users, the main users—'cause I know sometimes they can't send their entire procurement team out for training.
- F: That's funny.
- : Because I'm very detail-oriented people. Every time I ask a question, I'll ask very detailed things, like what, why why why?
- F: Why why why
- : Continually, why. Until I'm satisfied, I get an answer, I know what, where you are, and I'm really satisfied with that; then I'll stop. So sometimes they say don't ask me already! (both laugh)
- F: That's actually very similar to me. Maybe you should do a Ph.D. too!
- : Actually, when my master's program, I completed my master's program in 2006. At times, I think I tried the projects on the E-procurement, you know, all these other things, so after that, they said, why not continue a PhD? I said, no way already. (both laugh)
- F: But, do you feel that artificial intelligence tools will benefit the supplier selection process? The decision making?
- : But I don't know the artificial tools; we never use the artificial tools, we only all this, like internet meeting, you know?
- F: Well, what the main goal is, is that—in past research—First, let me begin with, a lot of research has not been done in Malaysia, number one. Number two, the artificial intelligence aspect of it—

- --when I tell people I'm doing artificial intelligence, firstly, they think I'm doing robots. No, this is not robots. (laughs). This is, where it is you're looking at, as you mentioned before, like E-bidding, that will kind of be something that will be imprinted onto a system, and you're going to be looking at past decisions, like technical ability, scoring, as you mentioned before, and it will be able to make decisions without more human input. It will be able to give you a decision without you going through the entire process, because it's looking from historical cases in the past. And the question is, in Malaysia, is it going to be beneficial? And, I mean, it may be beneficial for Intel, but maybe for smaller companies, it might not be. And by the end of my Ph.D. it will not only be Malaysia; it will be every country that has the infrastructure to use it. I think it will be beneficial, because it will look at things that you miss, as a human.
- : Yes, yes.
- F: So you have human intelligence and you have the artificial ones. And I think it will—the same way as Intel has removed and streamlined a lot of their processes, I think that artificial intelligence will be able to do that.
- : Yeah, yeah.
- F: Because I think it will know the process.
- : Yes, I think it will be benefit.
- F: It knows the process. And it will know the requirements. And it's not only going to be—it's a combination of business intelligence. So what the plan is, is to look at the business intelligence, too. So in your case it would be like the E-database. And it will scan through, like, the names of the suppliers, as well as the decisions that it made in selecting the supplier.
- : Yeah, correct.
- F: And then it will be able to regurgitate this, in a different instance with basically nearly the same type of information. Also I'm looking at not only existing suppliers, but selecting new suppliers, which is predicated on the supplier selection criteria. And then in each company, again, the selection criteria is going to be different.
- : Correct.
- F: So, as humans, we can then go along the only route that we know, which is that we're going to approach it by quality and cost and blah blah blah, but the intelligent system will be able to

look and analyze all of these criteria and choose which one probably will be the best, or maybe the top 5, and which will be most beneficial to the decision making process.

- : Yeah.
- F: So, it's more of a streamlining process. Because I've realized in Malaysia that there is not proper processes that is conducted to select suppliers. Unlike with this company that you are speaking of, this is a dream!
- : Oh, yeah. (both laugh)
- F: This is absolutely a dream.
- : But right now when you do your research, do you encounter any country, they have all these other things to choose really?
- F: Well, I am not actually doing a geographical comparison. I was focusing my energies onto Malaysia. But in reading, the literature is basically separated into Western literature and you have Asian literature or Eastern literature coming back from the Middle East spanning into Asia. And if you look at the Western literature that is written, again it is more streamlined, as what you are saying, because technically Intel is an American company base, and I believe that the reason why you have all these procedures and protocols and processes is because of that. And there is a different comparison, where it is, I believe, that Western companies are more process-oriented vs. the Asian companies; they're more results-oriented and they skip process.
- : Yeah…
- F: So there is a very big, big, big, large gap between it, and for you to actually compare, I would actually have to go to the States and to Canada, and to more Western, and conduct interviews there, and then I would have to do—
- : By the way, why would you want to choose Malaysia and here? I'm curious.
- : Oh, I see.
- : Ohh.
- F: Because to be quite
- F: So he's just networking me, and he's been so fantastic, because if I decided to do this project in the UK, I was not going to get access to information, because let me give you a funny story. Last year, my plan was not to do case studies, because the purpose of these interviews is case studies. And I decided, OK, I came to Malaysia in 2012 and I did some pilot interviews. It was more much shorter interviews. And I said OK, my next point is I'm going to—you've heard of the federation of Malaysian manufacturing?
- : Yes, FMM, is it?
- F: Exactly. So I decided, and I sift through that entire directory, and I pulled out over 2000 companies, and I thought yes, it's going to be a piece of cake; I am going to send a questionnaire to these 2000 companies and you will not believe the response rate I got. I got only eight back. (both laugh). Only eight. I got only eight back. So I had to reformulate my plan. 'Cause I was trying to do mixed methods. Yeah, I was trying to do a mixed methods Ph.D. And it turns out that I had to revert to only qualitative, where I'm doing case studies, and to even get the information for case studies, because one of the main things I was looking for for the companies I was interviewing, was to get past decisions that was made, judging, looking at their criteria and how they chose these suppliers, so I could run it through my framework, when I built it. Well, that also didn't happen, so I don't know exactly what I'm going to do, when I get back to London, about that part. But getting information about supplier selection process, and the types of information that is used, I got that. But as in testing a framework, I'm not sure exactly how I'm going to do that yet. But I'll hopefully perform some magic, I guess I'll have to kick in with plan D, not B or C, D and E. That's the thing with a Ph.D. It just takes you through so many types of situations that you have to be able to bounce back and to achieve your goal. So right now I'm actually executing Plan C, which is the case study interview. (both laugh)
- : OK. I hope that, you know, my sharing's able to help you—
- F: Oh, definitely.
- : on your research project.

- F: Actually, what your interview has done, it's given me an insight into larger corporations, and it's showing a very big difference in how process oriented ( laughs) and structured that it is, versus other companies who are local, because Intel is global, and it is showing a very big comparison as to how business is conducted.
- : Yeah. I think after that, when you hearing from the MSC company vs. the SME company, you are able to see the differences, you know. I think the differences is not a small differences, there are huge differences.
- F: It's huge differences! ( laughs) It's huge differences. And this brings me back to one of my initial thoughts, because I was looking at it as, if I can't get the testing framework I was actually going to do, what you just suggested, was a comparison between the Western and the Eastern. Because from how I understand, Intel is just, it's trickling down like Western processes. Because it's very process-oriented compared to Malaysian companies, local companies.

## Case F

FR: ok so the first question is, can you tell me the name and a little bit about the company?

FR: What does the company do?

Interviewee: We are the manufacturing, small machinery. Fabrication.

FR: Could you tell me like type of things you fabricate? What do you make? What do you do?

Interviewee: We do a lot. When we receive drawings from customers, and we do fabrication according to customer request.

FR: Are these requests project based?

Interviewee: Yes. It's not specified in any specific field. So once they have the drawing, we can fabricate according to drawing.

FR: So in that case, seeing that you are project based and you make many products.

In as much detail as possible, can you tell me how you select your suppliers?

Interviewee: Our supplier is based more on raw material. Ok we have many material suppliers.

Different categories, like normal supplier is a steel supplier.

Steel also has many different types, We select the supplier what is important is the quality, some suppliers they have control over the material very well.

Actually if the supplier says they have control to prevent raw material for a while.

Thus we have faced before, we buy material, but from supplier side if they unable to be punctual now or they bring us wrong raw material.

After that we go to secondary process the cause of the error quality is much important and service.

Plus the delivery also very important .

Because if the current market we need to complete our projects in a timely manner, due to competition.

Normally we have 4 weeks time to fabricate it. If they say the raw material supplier takes 1 week time, we will face problem.

FR: Coming back to supplier selection process. So because of this you'll have maybe a few suppliers that you are looking for a particular material and you'll look at quality, time, cost and service. And that is how you will choose your supplier. Which one is going to be able to give you what you want? Yes?

Interviewee: What?

FR: So I was asking about the supplier selection process. How are suppliers are chosen. So your project based client comes to you and gives you something that you need to fabricate, you look at it, you look at what you need to be able to provide the product to your client right. So you need to figure out what you need, as in materials to build it. So I'm assuming you have a supplier list and you are going to look through your supplier list to see who can give you the materials to build this.

Interviewee: yea normally we will send out the purchase order .

After that they will provide order quotation and delivery time and the cost. If they say the delivery is acceptable and cost is acceptable, we will select and start the job, important is the timing.

FR: Would you compromise cost for quality? Not cost, sorry. Delivery time for quality? If I say this one can be faster, so can you accept maybe lower quality? Would you be pay more for something that you'll get quicker?: if the suppliers did it faster, can you accept the price higher?

Interviewee: Normally we don't face this. Plus the pricing multiplies or gets half then the cost would be there, I think not so much difference. Normally we say the quotation very close to the price. It depends on how they can provide us the fast delivery. We cannot get material up to 2 weeks' time. Absolutely cannot. 3 to 4 days is maximum. Because any customer request fast delivery. It is currently the market situation.

Interviewee:2 :Unless it's a special material  Or the material needs to be imported.

FR: could you tell me how do you find your suppliers?

Interviewee: Normally we go to the exhibition or the other people introduce us.

FR: Do you use anything on the internet?

Interviewee: Yes we also use the internet

FR: Google?

Interviewee: Yup. Google

FR: Any other mobile app?

Interviewee: normally I use the Google.

Interviewee: Yes only goggle

FR: Do you use online yellow pages?

Interviewee: No

FR: Do you use green pages?

Interviewee: No. We use only Google oh! Ali Baba.

FR: If you go on to Ali Baba and you find a particular material you need, do you sometimes not contact them through Ali Baba but do you email them separately?

Interviewee: : We find a supplier from there and we contact them directly.

FR: Do you do site visits?

Interviewee: Site visit it depends. If the suppliers are overseas it is very difficult.

FR: Do you have any suppliers overseas?

Interviewee: We have. Like Singapore and China.

FR: Is it steel that you are sourcing from them or is it other materials?

Interviewee: I think one supplier is introduced by my friend. Because supplier is my friends, so they already have experience, so they just introduce to us.

FR: Do you ever find, in your email for instance, that you get random emails from suppliers that's giving you information to what they have?

Interviewee: Yes. Always have supplier side information to us but I never use it. We unable to go to site visit. This is the problem.

FR: Has there ever been a case, where you needed a particular material and you were not able to source it from your current suppliers?

Interviewee: So if they say they we facing this issue, I call a friend. They have the information. So and also search in the website. I think this question we facing last 2 weeks. So this special material we unable to get. So then we outsource from India and China.

FR: But that means you had to pay more or hold off your client longer, because that means you had to wait on delivery time.

Interviewee: yea. We do inform the customer that we need to import this material and I think it take how many weeks, then ok. If they accept, then we do it. If customer say they are out, we unable to do anything. Because the Malaysian market don't have this material. We cannot do anything.

FR: Do you have a specific like a written down process of a supplier selection like flow chart? Do you have one?

FR: For your processes, in-house process. Do you have something like this? Ok so you select your supplier,you put it on a list.

Interviewee: normally the supplier we already have the existing supplier list.

FR: Do you have a generic way that you go about? Let's just say you have purchasing department. And let's just say somebody new starts to work here, new person. And you need to train them as to your supplier selection process or your…

Interviewee: : We have the list. If the new person, they join us, we have the list in our system.

FR: But do you have a process in which you can show them how to follow, how to go about selecting supplier. Do you have a particular way in which it is done?

Interviewee: No, because the supplier list we have. They just mention which supplier supplies what. So whenever we have a new guy who joins, then it depends currently what material we need to purchase. Let's say we want to purchase aluminum. So the new guy will see aluminum supplier, who they are

FR: In that same instance, let's just say for example, you have 10 aluminum suppliers. How do you go about selecting one of them from the 10?

Interviewee: Normally we look at service.

FR: So you send purchase order? Is it purchase order or is it IFQ?

Interviewee: IFQ.

FR: send IFQ to all 10?

Interviewee: No normally not all 10. The best service supplier for us, maybe we have 10, we will send minimum 3.

FR: how do you select from that 10, the 3?

Interviewee: Normally it is based on their service. We have monitor the service from past transactions from them. If they say this supplier always delay the delivery we will not choose them.

FR: So when you are doing you evaluation, you look at service, is there anything else you look at?

Interviewee: Service, cost and delivery normally. These three are most important.

FR: How often do you evaluate? 3 months? 6 months? 9 months? 1 year?

Interviewee: 3 months, actually every month we have the supplier performance. If they say the supplier still is maintaining good service, they always get quotation from us, if they say they have any issue on delivery 1 time, 2 times.

FR: They come off your list?

Interviewee: yea.

FR: so if you do this on monthly basis. So therefore this is auditing in a way? This is probably what you call auditing.

Interviewee: yea we have

FR: So you audit on a monthly basis but do you do anything on a yearly basis?

Interviewee: Actually, for our purchasing, normally we don't audit, we just monitor. The raw material supplier, I think doesn't have anything to audit.

FR: let's think about it like this, you have a supplier list, do you supply...

Interviewee: We audit the other supplier because this process will be more important. So the raw material supplier, we normally don't audit, because the material we can request the material certificate from them. It is a proof where the material is from which country.

FR: But that will be more on quality side of it.

Interviewee: Soon because they provide us with a mill certification (mill cert) that means this material manufacturing is from where who is the manufacturing, we already know the supplier is verified and it  is it possible to use. So we are safe in raw materials.

FR: Who is responsible for making the final decision? So when you chose a supplier, because you remember before you use an example where we said we have 10, you selected 3 and you send the IFQ. And which one comes back and who makes the decision, which one you going to use?

Interviewee: Normally it is decided by our purchasing department, then purchasing already selects and they will issue out the purchasing order.

FR: So in your opinion, are there any issue or problems with your current process in how you select your suppliers?

Interviewee: So far we have no faced any difficulty.

FR: Ok. Alright. So do you think that information technology has helped you in selecting your suppliers? (like the internet, anything online or computers)

Interviewee: Yes. Because our customers sometimes also finds us through the internet. Not only the supplier, we can source the suppliers, we find suppliers, we can also get customer information through the internet. Its very good.

FR: So on your website, do you have the services you provide as well as past projects that you have done, so the customers can see and they come to you?

Interviewee: Yes. Through internet.

FR: so what type of information technology tools that you use to support your supplier selection process? Do you use Microsoft excel?

Interviewee: We use our own system.

FR: Could you tell me what is the name of it?

Interviewee: System name is MAP system.

FR: And it's Malaysian?

Interviewee: It is Malaysian yes.

FR: May I ask where did you source it?

Interviewee: It is through our supplier. We were recommended through one of our suppliers who also uses this software.

FR: Could you tell me what do you input onto this MAP? What do you key in?

Interviewee: The supplier request, name, address, what type of business they are doing, what material they can supply.

FR: How long have you been using this system?

Interviewee: I think around 3 years.

FR: prior to that? Before you used MAP?

Interviewee: Excel

FR: When you use MAP, did you import the information from excel from Map or did you start over?

Interviewee: I think we did one by one. We copy from excel.

FR: So you have your suppliers, location the type of information that they use on MAP but do you do anything manually? Is anything still done on paper?

Interviewee: no we issue out the order through the system

FR: and when you collect payment, it goes into MAP as well?

Interviewee: Because the best system is the process console, the accounting is others, so we use the other software.

FR: So what types of information comes out of MAP? Where do you reports come from? You mentioned on a monthly basis you do performance report. Where does that come from? Where do you get the information from?

Interviewee: They have supply audit.

FR: So which department uses MAP?

Interviewee: All departments can use purchasing, planning, production.

Interviewee: 2 : Except Finance.

Interviewee: : Finance also takes from the system and converts it to SQL.

FR: so finance is still using excel. SQL is apart of excel. So they still using it?

Interviewee: yea, because before that we using the SQL already from beginning until now, so after that, then I think past 2 years ago we just use the new system. So SQL we already have, so we still continue to use.

FR: So SQL that you use, is it a system or is it on excel?

Interviewee: System.

FR: So do you pull like bar charts out of it? What kind of information does SQL pull? That you get from it? Like how is it represented? Bar chart? Line graph?

Interviewee: Yea. Pie chart.

FR: so at any point in time do you audit MAP? Let's just say you have been using this system for 3 years. You have how many suppliers on an average?

Interviewee: supplier. A lot. I think more than 100, Because we have different types of material and other supplier also a lot.

FR: Is there any processes that you do to make sure that the information on Map is correct? On your MAP, there is supplier name, supplier address, contact detail, email, phone number and type of products that they supply, is there any process that you go back to, like every 3 months, 6 months to make sure all of that information is correct.

Interviewee: Normally if they say supplier they have new product or they have moved to other place, they will inform us, and then we need to update into our system. So they cannot automatic generate, Information must be provided by them.

FR: So it's only when they tell you, is when you are updated

Interviewee: If they don't tell us, we won't know.

FR: so you don't, let's just say every year go through your entire system?

Interviewee: The raw material supplier, we don't audit as we have the mill certificate so we do not need to audit.

FR: Let's use the example of going back to aluminum supplier you have 10 of them, and you selected 3. So in many cases I assume you will always go back to these 3, most times.

Interviewee: we sometime we also send others. We also need to keep the relationship. Very important because all of them are our suppliers we still give the order to them but it is very less.

FR: not as much as the others

Interviewee: : ya.

FR: So are you maintaining the relationship, you also maintain your data. Correct?

Interviewee: Yes.

FR: So you mentioned before, why you chose MAP. Why did you choose MAP?

Interviewee: They present the system to us, and then we will see.

FR: So you were using excel before

Interviewee: We use excel but it was always manual. We need to do it ourselves. In the other system, we just feed what we wanted it to show then I can link with all departments, so we can see every data in the system.

FR: and this is something you could not have done when you were using excel.

Interviewee: : Ya

FR: So what types of problems you had when you were using it.

Interviewee: It's not the problem. Actually we use the system for us it's easier for controlling. It's not the program, EXCEL never caused the problem to us but everything we must remember.

FR: So therefore if it was manual, that means sometimes your data wasn't accurate?

Interviewee: Because we have daily meeting, the think the data is not a big issue. For me based on my opinion, to use my system is easier for us to control. From getting the order to delivery, we know the process. If they say you use the excel, you cannot bring everybody. This is the problem. In our system, you have the ID already can log in to our system and to see.

FR: Who has the access to it?

Interviewee: The Head of department.

FR: And purchasing as well?

Interviewee: Actually purchasing, they only log in to purchasing parts. They cannot go to other side. We have control this.

FR: In your opinion, is there any managerial concerns or problems that impacts on your supplier decision making? Is there any cases where you have a specific supplier that management continuously want to use or are quite happy to use anyone which is more beneficial to the business.

Interviewee: It depends on the drawing, the technical ability. Because sometimes the drawing have specified the accuracy, everything. So we cannot use the normal material to process it. We were facing problem. So we must specify, we need to use this specific material. Actually material maybe same,  like the aluminum 6 series. They all 6 series but this supplier, 6 serial material is different because they have control over thickness and the fatness. So we cannot use the others. Also the same type material. But the tallness is different. So we cannot use the others. we need to specify. So we will key in this information in our system. Whenever this order goes to the purchasing side, the purchasing side cannot select the supplier. They must follow engineering department machine.

FR: So you put in your engineering requirement into MAP as well?

Interviewee:Ya. So the purchasing will see. This material they cannot change

FR: So you have the technical side, you have the customer requirement from your side which is the delivery time, price, etc. All of this goes into MAP? Does MAP have an analytical processing where it chooses a particular supplier for you?

Interviewee: No. the purchasing selects themself. If there is a special case, every drawing passes through engineering side. So engineering after reviewing the drawing, they have decided this normal material can be used, if they say this material, specify the high position, the engineering already decided so the purchasing cannot change it. If they say change, the whole process will be gone..

FR: let's just say for instance, you got your technical requirements from your engineers; your customer gave it to you, you gave it to your engineers and they say what they need. Do you log under that project, those technical requirements into MAP as a particular field? So one field is the supplier name, others is the location blah blah blah. So you have all of the contact details. So the supplier will be able to provide you with aluminum? Do you have different types?

Interviewee: we need not set the supplier name. We set the material aspects.

FR: Under the material aspect. Do you put what they have provided you in the past? I don't know how it works. I'm assuming aluminum has different kinds. Do you put that in? Do you report that as the different types? Because what I'm thinking is that, let's just say, you need to build something that you have built before with relatively similar specs.

Interviewee: Repeating order

FR: Yes, something like repeating order.

Interviewee: Because we are based on drawing number the information, whenever the purchasing need to purchase the raw material for this drawing number, all the information will be accordingly to this number. so if they say it is repeating job, purchasing already knows. Who is the previous supplier? What material we are using? Everything.

FR: Is MAP sold to anyone? Could I go on the internet and look for MAP system and it will come up on the internet?

Interviewee: I don't know. We more prefer the system my previous company, we write the system by our self. In previous company the whole system until today

FR: You have all these different systems, all of these systems that many companies use, why do you feel that it is not meeting your need? You just mentioned that.

Interviewee: Because our business is different, our processes are different. Our business grows and processes change to suit our clients, we have to change as well.

FR: Is it MAP?

Interviewee: MAPS. So that is why most of Malaysian company, use local software because it's not too complicated and more suitable for our manufacturing. Actually they provide the basis; we also need to discuss with them what we want. After using one month we have meeting and we tell them what issue we facing. They will change according to our interest. Sometimes it is designed by our self. They only provide the basis. My system, they can do this blah blah blah. Whenever you use already, you know already, requirement is different. So our manufacturing and the trading company is different right. So we will request them to change. Now we facing this problem. Can you change? Then they will do for you.

FR: So whenever you change, how you do things, you also change it on your system as well?

Interviewee: yea we request. Just like mobile phone. You can see that in Malaysia, android user is more than apple user. Why? Because apple everything is locked. You cannot change it. You only can use the android. So the homepage I put this one. So they can customize for our needs.

FR : That was my last question. Thanks you very much

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